APPENDIX



Terrestrial and Aquatic Ecology

Part 3 of 4

GOWRIE TO HELIDON ENVIRONMENTAL IMPACT STATEMENT



The Australian Government is deliver Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

APPENDIX

Terrestrial and Aquatic Ecology

Appendix G Predicted habitat mapping

GOWRIE TO HELIDON ENVIRONMENTAL IMPACT STATEMENT





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APPENDIX

Terrestrial and Aquatic Ecology

Appendix H Aquatic ecology survey sites

GOWRIE TO HELIDON ENVIRONMENTAL IMPACT STATEMENT



Appendix H Aquatic Ecology Survey Sites

Site	Description	Photo
1A	The site is located on Gowrie Creek, upstream of the Project alignment. Artificial bank protection measures present, which include concrete box culverts with the bridge crossing.	
2A	The site is located on Gowrie Creek, at the proposed Project alignment waterway crossing location. The site was disturbed by the destruction of a road bridge as well as local impacts include grazing by horses and litter from flood debris including sheet metal.	
ЗА	The site is located on Gowrie Creek, downstream of the Project alignment. The site is adjacent to the rail corridor and the Toowoomba Second Range Crossing.	<image/>



Site	Description	Photo
4A	The site is located on Oaky/Rocky Creek, downstream of the Project alignment. The creek was dry at the time of assessment. There were no artificial bank protection measures present. Debris were present from flood events including old cars, wire, metal posts, asbestos sheeting.	
5A	The site is located on Oaky/Rocky Creek, downstream of the Project alignment. The creek was dry at the time of assessment. Vegetation was located within the creek bed. Riparian zone was highly disturbed.	
6A	The site is located on Rocky Creek, downstream of the Project alignment. A significant density of macrophytes were present, principally Typha. The site was disturbed by the bed level crossing and culvert.	



Site	Description	Photo
7A (alt)	The site was located on Six Mile Creek, downstream of the Project alignment. Banks were eroded which is potentially affected by stock access.	
8A	The site was located on an un-named tributary off Lockyer Creek, upstream of the Project alignment. Fences and metal sheeting were present along the width of the creek. The creek was dry at the time of assessment.	
9A	The site was located on Lockyer Creek, upstream of the Project alignment in a road crossing over a bridge. Bank stability was potentially affected by cleared vegetation and stock access. Rocks were present along the bank.	<image/>



Site	Description	Photo
10A	The site is located on Rocky Creek, upstream of the Project alignment. Artificial measures include the bridge with rock/wall layers for bank protection measures.	
H2C 11A	Site was located on the Lockyer Creek, downstream of the Project alignment. No artificial bank protection measure was present. There was lots of floating aquatic vegetation present on the surface of the water.	<image/>



AUSRIVAS Physical Assessment Protocol Field Data Sheets	Page 1 Site No. 1A	Date 19.09.17
Date 19.09.17 Site No. 1A Ti River Name GOWFIE Creek Location	re 1000 Recorder's Name	JS + 44
Weather <u>Fine + Sanny</u> Rain in last week? Y [] N		sa's lphon
GPS Name and Datum Sike (A.		
PLANFORM SKETCH OF SITE Including bedform types, location of cross-sections, access points, landmarks and natural or artificial ch Left bank is facing downstream.	nel or floodplain features. Bankfull width	LING SITE (m
	Length of sampling	site(m
	Notes	
	BEFORE LEAVING SITE, CHECK DAT SHEETS TO ENSU THAT ALL VARIAE HAVE BEEN RECO	THE TA JRE BLES ORDED

Acknowledgments - The content and layout of these data sheets are derived from the sheets used in the River Habitat Audit Procedure (Anderson, 1993a), AUSRIVAS, the Index of Stream Condition (Ladson and White, 1999 and DNRE Victoria) and the River Habitat Survey (Raven et al., 1998).

Page 2

Site No. <u>IA</u> Date <u>19.09.17</u>

BASIC WATER CHEMISTRY	Units	Valley shape Choose one category only	Local impacts on streams
Temperature	°c	Steep valley	Sand or gravel mining Sewage effluent
Dissolved Oxygen Sat	mg Г ¹ %	Shallow valley	Road River improvement works
pH	,,,	Broad valley	Ford / ramp Ubischarge pipe Into Pe U Grazing Furgenstructure
Total phosphorus	_	Gorge	Forestry activities Litter Sugar mill Recreation
≥ ALKALINITY Amount of water	ml	Symmetrical floodplain	Description Creek crossing adjacent
Amount of H ₂ SO ₄	ml mg l ⁻¹	Asymmetrical floodplain	to avvent TSRC construction t voil cowidor Blue poch from retaining wall faller into creet. Local landuse
Floodplain width		Average (m)	Choose one category for each bank Left Right Native forest
 Choose one or more features when present Sampling site has no distinct floodplain Oxbows / billabongs Body of water occupying a former river meander, isolated by a shift in the stream channel Remnant channels Formed during a previous hydrological regime. May be infilled with sediment Flood channels A channel that distributes water onto the floodplain and off the floodplain during floods 	Sc She alo Sm ove and Flo Sc cle Flo Sc cle Flo do	roll systems ort, crescentic strips or patches formed ng the inner bank of a stream meander lays hall alluvial fan formed where an erloaded stream breaks through a levee d deposits material on the floodplain bodplain scours our holes formed by the concentrated aring and digging action of flowing water of floodplain features present bodplain present at the sampling site but es not contain any of the above features	Native grassland (not grazed) Grazing (native or non-native pasture) Exotic grassland (lawns etc., no grazing) Forestry Native [][] Pine [][] Cropped Rainfed [][] Irrigated [][] Urban residential Commercial Industrial or intensive agricultural Other



Very high disturbance



◄ Riparian ►

-Valley-

Riparian vegetation - some native vegetation present, but it is severely modified BOTH sides by grazing or the intrusion of exotic species. Native species severely reduced in number and cover

exotic species (willows, pines etc.)

Valley vegetation - agriculture and/or cleared land BOTH sides. Plants present are virtually all exotic species (willows, pines etc.)

side clearly disturbed or with a high percentage of introduced species present

Moderate disturbance



◄ Riparian ▶

-Valley-

Riparian vegetation - native vegetation on BOTH sides with canopy intact or with native species widespread and common in the riparian zone. The intrusion of exotic species is minor and of moderate

Valley vegetation - agriculture and/or cleared land on ONE side, native vegetation on the other in reasonably undisturbed state



◄ Riparian ▶

-Valley -

Riparian vegetation - native vegetation present on BOTH sides of the river and in an undisturbed state. Exotic species are absent or rare. Representative of natural vegetation in excellent condition

canopy and few exotic species

Valley vegetation - native vegetation present on BOTH sides of the river with an intact canopy. Exotic species are absent or rare. Representative of natural vegetation in excellent condition

Page 4

G2H

Site No. 1A Date 19.09.17





Page (6	Site

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Site No. _____ Date _____
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Extent of bed	form feature	s	Macrophyte cover Assess % cover of the sampling site by each category.								
Total % compos	sition for all fea	tures must equal 100%			veral						
Height >1m	Waterfall	% of site	Overall % cover of macrophy	tes	% cover of emergent macrophytes	dual o					
in Acar H		Est. Av. Length (m)			% cover of floating macrophytes	- And a set					
of now wider		Est. Av. Gradient (°)			% cover of submerged macrophytes	tal shor					
Step Height <1m Gradient 5-60° Strong currents	Cascade	% of site Est. Av. Length (m) Est. Av. Height (m) Est. Av. Gradient (°)	Macrophyte composition Use a macrophyte field guide (i Listed macrophytes can be cha N denotes a native taxa and I d	i.e. Sainty and Jac inged to reflect the denotes an introdu	cobs, 1994) to aid identification. e common taxa present in each State or Territe iced taxa.	Ë% ory.					
Gradient 3-5° Strong currents	Rapid	% of site	Emergent macrophytes	D/	Submerged macrophytes						
Rocks break	Blo-	Est. Av. Length (m)	P	resent cover	Present cover						
surrace	See Las	Est. Av. Depth (m) Est. Av. Width (m)	Brachiaria (Para Grass) I	\Box	Ceratophyllum (Hornwort) N						
Gradient 1.3°	Diffle		Crassula (Crassula) N		Chara (Stonewart) N						
Moderate currents	Kille	Est Av Length (m)	Cyperus (Sedge) I/N	Ц	Elodea (Canadian Pondweed)	-					
Surface unbroken but unsmooth	Contraction of the local division of the loc	0-20 Est. Av. Depth (m)	Eleocharis (Spikerush) N		Myriophyllum (Water Milfoil) AN						
		2M Est. Av. Width (m)	Juncus (Rush) I/N		Nitella (Stonewart) N						
Gradient 1-3°	Glide	% of site	Paspalum (Water Couch) N	4	Potamogeton (Pondweed) N	_					
Small currents Surface unbroken	Contraction of the local division of the loc	Est. Av. Length (m)	Phragmites (Common Reed) N		Triglochin (Water Ribbon) N	- 2					
and smooth		Est. Av. Depth (m)	Ranunculus (Buttercup) I		Vallisneria (Ribbonweed) N	_					
	-	Est. Av. width (m)	Scirpus (Clubrush) N		Other	_					
Gradient 1-3° Small but distinct	Run	90 % of site	Triglochin (Water Ribbon) N	\Box	Other						
& uniform current	1	C:5 Est Av. Length (m)	Typha (Cumbungi) N	V 15	Other						
oundee unbroken	(III)	Est. Av. Width (m)	Other		Floring more but a						
Area where	Pool		Other		Floating macrophytes %						
stream widens or	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	% of site	Other		Azolla (Azolla) N						
deepens and current declines		Est. Av. Length (m)			Califriche (Stanwart) I						
		Est. Av. Width (m)				-					
A managable sized	Backwater	% of site			Other						
(>20% of channel	AA	Est. Av. Length (m)				-					
width) cut-off section away from		Est. Av. Depth (m)	-								
	E	Est. Av. Width (m)	Overall % cover of native ma	acrophyte taxa	Total should equal overall % cover						
Note: An additional re	esponse variable pl	anform channel pattern	Overall % cover of mative ma	acrophyte taxa	of macrophytes from above						
is measured in the off	fice		export								

·



Site No. 1A Date



Choose one category only Assess cobble, pebble and gravel fractions only



In the USEPA Habitat Assessment on the following pages, be sure to use the correct form for high or low gradient streams



Bed stability rating Choose one category only

Unstable	- eroding	Stable	Unstable -	depositing
Severe erosion	Moderate erosion	Bed stable	Moderate deposition	Severe deposition
Streambed sccured of fine sediments. Signs of channel deepening. Bare, severely ercded banks. Erosion heads. Steep streambed caused by erosion.	Little fine sediment present. Signs of channel deepening. Eroded banks. Streambed deep and narrow. Steep streambed comprised of unconsolidated (Icosely arranged and unpacked) material	A range of sediment sizes present in the streambed. Channel is in a 'relatively natura' state (not deepened or infilled). Bed and bar sediments are roughly the same size. Banks stable. Streambed comprised of consolidated	Moderate build-up of fine sediments at obstructions and bars. Streambed flat and uniform. Channel wide and shallow.	Extensive build up of fine sediments to form a flat bed. Channel blocked, but wide and shallow. Bars large and covering most of the bed or banks. Streambed comprised of unconsolidated (loosely arranged and unpacked) material.
		(tightly arranged and packed) material.	1	

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AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 8 Site No. _____ Date

USEPA Habitat Assessment HIGH GRADIENT STREAMS Page 1 of 2 Circle a score for each parameter

Habital Condition category parameter Excellent Good Fair Pcor Greater than 70% of 40-70% mix of stable 1. 20-40% mix of stable Less than 20% stable substrate favourable for hat well suited for habilat, habilat heortal; fack of habital is Epidaumai epitaunal colonisation and **U** constant availability less than davicus; substrate substrate / fish cover, mix of shaces. octentia: adequate desirable; substrate unstable or acizing. available cover Submerged logs, undercut natival to maintenance. frequency disturbed or banks, cobble or other of populations; presence готскег. stable habitat and at stage of additional substrate in to allow £.0 colonisation the form of new all but potential (i.e. logs/snags not yet prepared for that are not new fail and colonisation (cray rate at not iransient i nich and ei scale). SCORE 20 19 18 17 15 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 2 Grave, cooole and Gravel, cobble and Gravel, atthe and Gravel, cobbe and boulder carticles are 0boulder particles are 25-Embéddedness bouider particles are 50bouider particles are 25% surrounded by line 50% surrounded by fine 75% surrounded by fine more than 75% schounced by fine sedment. Layering of seciment Jinemátsek cobble provides diversity sedment. of niche space. SCORE 20 19 18 17 15 15 14 13 12 11 10 9 3 3 4 3 2 1 3 7 6 5 All four velocity/depth : Only 3 of the 4 registes. Dominated by 1 3 Ciny 2 of the 4 national regimes present (slowweitern (filfast shatow is regimes present (if fastvelocity/depth regime Velocity / depth Deep, slow-shappy, lastmissino, score lower stratow or stew-shalow (usually sicw-ceep). regime deen fast station]. Slow ; stan il missing other are massing, score low). is <0.3m/s, deep is . regimesj. >0,5m). SCORE 20 19 18 17 15 ⁱ 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 3 4 Little or no extangement of Some new increase in Moderate deposition of Heavy deposits of fine Sediment islands or point bars and bar formation, mostly new gravel, sand or fire ndaial noreaseibar less than 5% of the bottom som gravel, sand or fine sediment on our and development: more than deposition affected by sedation1 new bars; 30-50% of the sectors 5-30% of the 50% of the boltom deposition. totion affected, slight bottom affected charking frequently; deposition in pools. segment depression at pools almost accers! due ocstructors. to substanced segment constrictions and bencs; deposition moderate deposition in poos prevalent. SCORE 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 D Water reaches base of 5. Neer 11s >75% of the Water fills 25-75% of the Very little water in both lower banks, and evaluable channel; or a ciable charnel Channel flow thannel and mostly minimal amount of <25% of channel and/or rifle substrates present as standing status channel substrate is substrate is exposed. are mostly exposed. pools, ecced SCORE 20 19 18 17 15 15 14 13 12 11 10 3 8 7 5 4 3 2 1 0 Б 6. Charme\$22lion or Some channelization Channelozion may be Banks shored with checking absent or DESERT USUALLY IN A SAS ecensive: embaryments nation or cestert over Channel minimal; stream with of bridge abutman's; or shoring structures 50% of the stream reach. atteration not nei patiern. evidence of past present on both banks; charoetzeciand diarrosization, i.e. and 40 to 60% of stream disructed. Insteam dreciging (greater than reach charmained and hebitat greesly aftered or 20 yr) may be present, dsrupled. removed entirely. but recent chameigation is not aresent. SCORE 20 19 18 17 16 15 14 13 12 11 10 9 5 7 6 5 4 3 2 1 0

Continued over

AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 9 Site No.($\frac{22}{4}$ / $\frac{4}{4}$ Date _____

USEPA Habitat Assessment Circle a score for each parameter

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HIGH GRADIENT STREAMS

Page 2 of 2

Habitat				•			С	0:10	lition	. cate	-giùr	Y									
parameter	E	xcel	ent			1	Gc-od					Fair			Poor						
7. Frequency of riffles (or bends)	Occurre relatively al distan rifles th the stream generat of habita streams of habita streams of bould large, or is import	Occ infre bew by Si stree 15	urren Queri Neen r Ne wit am is	ce of m t dista iffes d th of f betwee	Yes ace ivide ac an J∩	d B	Occ both som betw by 6 stree 25	Serveraby all fat water or shallow riffes; poor "statist; distance between milles chroad by the width of the stream is a rate of >25.													
SCORE	20 19	: 16	15	14	13	12	11	10 9 8 7 E				E	5	4	3	2	1	10			
8. Bank stability (score each bank]	Banks st of ercs-o absent o potential problem affected	tables in er b in minn for tei s. ⊲9	ewicer ank, fa mai; ik histe Si of b	cə ixiie te ark	Nod infre of er over read ≌ros	ly stabl L small L mosta DS4 of L S artess	s And .in	Mod 90% has tégh durit	Unstable; many eroded areas; 'raw' areas frequest dong straight sections and bends; obvious bank stoughing; 50-100% of bank has ensioned scars.												
SCORE	Leita	*	10	9	8		7	Τ	6	5		4		3	2		1	1	:	1	
SCORE	Right b	anix	10	9	- 5		7	Τ	6	5	1	4	T	3	2		1	L		0	
9. Vegetative protection (score each bask)	More Se streamb and imm zone cou vegetatio breas, un structs, macrophic grazing manimal aimost a to grow	en 903 ank st rectate vered ant, inc nders) ac not or mot or mot er net st plan actura	S of the infaces inpani by nation auting arby ways invector ways invector i	e s an he l y xive t wed	70-5 Stree Stree vege stree vege reprint full (lo ar the state rem	70-90% of the streambark surfaces covered by native vegetation, but one class of pains is not well- represented; disruption evident bus not affecting full part growth potential to any great extent; more than one hail of the potential plant stubble begint					50-70% of the streambark surfaces covered by vegetation; deruption obvious; patches of bare so? or cleasity copped vegetation common; less than orse-raif of the potential plant stucke height remaining.						Less than 50% of the strambark suitaces covered by vegetsion; demption of streambank vegetation is very tight vegetation has been removed to 5 centimetires or less in average stubble height.				
SCORE	Leftbar	à l	10	9	8		7	Т	6	5	:	4	I	3	2		1	3		0	
SCORE	RgHiù	ank.	10	9	8		7	1	6	5	-	4		3	2		1	1		0	
10. Rigarian zor.e score (score each tank)	With of riparian zone >18 metres; Iturnan activities (r.e. roads, lawns, props etc.) have not impedied the ciparian				Yác 12-1 acth Utei min	Victh of ripanen zone 12-18 metres; hernan activities have impacted the riparian zone only minimaly.					Width of nparian zone 6- 12 stellers; human activities have impacted the sparian zone a great cleal					Width of ripasian zone <5 metres; it de or no ripatian vegetation is present because of human activities					
SCORE	Leiba	nk	10	9	6	- T	7	-	6	5	; [4		3	2	:		1		C	
SCORE	Ro12	ank	10	9	8	.	7	1	6	Ís	Ť	\$	Ť	3	2			1	1	ç.	

TOTAL HIGH GRADIENT HABITAT SCORE



AUSRIVAS Physical and Chemical Assessment Rrotocol Field Data Sheets Page 10 Site No. G7.H 7.A Date $\underline{19.07}$ 7.7

USEPA Habitat Assessment

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USEPA Habitat Circle a score for	Ass: each	essr para	nent mete	। भ	1	L01	W	GR	AD	IEI	NT	ST	RE	A	IS			F	oage	10	f 2
Habitat	1							- (Cond	itior	i cate	-006							• •		_
parameter	\vdash	Ex	celle	ent		Good					Fair					Poor					
		ar ar th	an 60	Si af		: 30.50% microf etable				1 10.3		n v rf	er e de		1.00	r ih:	-	E' att	- مارخ		
Egifaunal	site	strate	favou	rable I	0	hab	iat w	e su	led for		hab)	bat h	aŭ a	5,60%	•	hat	nias Mas	lack	of hab	dati	is
substrater	epë;	ana' i	colonia	sation		fuil c	alonis	at on			ลลั	aoī4	r iess	than		des.	រំរាន	SIC.	sorate		
available cover	and	នោទ	DNE, I berovi	mixtof		pole	TŪŠ: ₩¥ (wa	adequ	sle Lanan		Cesu 6	ate	subs	raie		l USTLE	nabie	er k	icking		
	lund	n,su aratt:	unue y Janks	cabl	r ² . Ke	of D	iatio. Dui∓	20051 0	renan. X≪ar	-e 109	nemo	-sauy Saed	350	rceo							
	or other stable habitat					ofa	ision	el su:	sia	ir.						1					
	and	2.52	ge la	aliowi	u	lhei		i newi	fat, bu	3											
	l í e	ioosis	macs	traa tha a	æ	nou Crin	nes pre nissair	spane. mima	1 KUT NA TATA												
	roti	new fa	d and	10		high	endi	r sca	e.												
	l'ran	siant)											-			<u>i</u>					_
SCORE	20	19	18	17	16	15	14	13	12	11	(10)	9	8	7	6	5	4	3	2	í	0
2.	Not	ure o	subs	irate		Med	ure di	soft s	and.		АЛ	udo	rcej	or sa	nd	На	d çe	n ch	y or		
Pool substrate	mau	erads,	with i) y y y		TT-JC	orcl	5; MC	d ma	r .	betto	រាជ និ	1e or	no re	ol.	bec	Fock	: 001	m loci	at o	ſ
characterization	i nact	mais	and p	CEVEE	1×.	ಜ್	ហារនេ ទំនានី	na so Saban	ne ro eroed	a	imer, Ivrene	neis Istini	LOME 1	igec		1.185	jel 20	on.			
	5.0	merge	€ veg	elalio	1	vegalizion present.					Jonneye										
	<u> </u>	mon,		_							L			-		<u> </u>					_
SCORE	20	19	10	17	16	15	14	13	12	11	10	۹ (ワ	17	6	5	4	E	2	1	¢
3.	Eve	г. пах	of leng	ι÷-		Maj	T SI C	f poots	s large	÷	Shai	jow b	icols i	urcy		Majority of pools arrest-					
Pool variability	80	San Li	rge o	800. M 72		i debo; vezy iew sinezow.					mare	s brs	raient S	than		she	вси:	or pr	iós at	K CI	Ι.
	Cee;	pcot	s pres	ert.																	
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	Ē	7	6	5	4	3 (D	1	٥
4.	나바	e or no	>enia	game	E.	Some new increase in				Мой	0 26	dæc	skon	of	Hə	éry é	ieņos	is of	fne		
Sediment	이희	landa Lec 1	tr po	nd bar 165 mi	د مد	bar formation mostly					new gravel, sand or fine settimestion old and					material, increased bar development: more than					_
deposition	both	una:	ected	by		sed	ment;	20-53	P‰ of	lhe	Dev:	bars;	50-8	0% 0	i he	60	n di	the b	ciom	- 16	
	sedi	ा शाल	depos	r.im,		bota	un af	ecteo	ន៍ថ្ង		bottom affected; seciment deposits at obstructions; constrictions and bends;					changing treatently;					
						dep	istor	in po	ols.							pot	15 Z	nosi	abser	10.	E
																i der	NESS VISE	ariua Ofi	sea		C
											m00	erate	deçe	stion	in .						
SCORE		1							-		pe 03	s pre	veien	<u> </u>	-	<u>.</u>	_		·	_	
JOONE	20	19	18	17	16	15	14	ு	12	11	10	9	8	7	6	5	4	3	2	1	¢
5.	199	e isa	ches	tase	x.	Wa	er f k	>75%	Soof Lin	e	Wa	er fik	s 25-7	/5% o	l îne	Ye	n 81	ewz	ier n		
Channel flow	i con	inal a	n Dealtrai Trailean	3,33⊪ '0'	1	25 25	auer Sinte	arenen tranva	e;or el		ant ant	15105 111 10	CTAT In Sui	net. Nationali	29	i cna Linne	sart sart	.ang 25.st	IT OSU Izročio	7	
status	char	TES	ub stra	te is		sie	strale	is equ	esed.		aren	TCE:	γep	ose1	~	po	js.			2	
ROODE	exp	ced.	<u>~</u> ``			<u> </u>		_		-	L_		-		<u> </u>	<u> </u>		_			
SCORE	20	59	B	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	Ġ
b. Channel	l Cha	nneliz icine :	acon : atseri	ar tar		San	ie dra ieri	nneiz sur¥-	asion in ar	×.	i Cha	nnela calent	aior emb	(112) 1	be entr	Ba ees	ni.S.S Sint	hore	d with move	0	
alteration	mo	mal; s	bream	iwash		dia	idge a	itz im	ars:		as	naire	j stru	cure	-	30	ă dî	ine s	trear	163	ch
	non	nei pa	ttern.			evio	ence	of pæs	t		pres	ent o	nbes	r bari	\$;	CÎN:	me	icad -	and		
						dire:	nec: kina:	≊.cαti intre≉	i.e. Er (næ		and Trees	s:1to tardra	n BU% Yonef•	of S2 april a	earn M	65 1-2	ntc% M≓	u ir	nsbrea Iv ail≃	m radio	•
						20 1	ņта	y be p	CÉSET	ί	ç casın	.pted			~	ran	10.9	d em	nely.		-
						buzi	recen				2					İ			•		
						Char Dies	nec: st	ECAL	snal												
SCORE	20	19	18	17	16	15	54	13	12	11	10	ç	a	7	6	5	4	3	2	1	C
							1 1	L 7 i	7		:		1	1	1				1 ···		-

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USEPA Habitat Assessment LOW GRADIENT STREAMS Page 2 of 2

Circle a score for each parameter

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Habilat					Co	ndilior	i calego	ny -					
parameter	Excel	fent			Good			Fair			Poor		
7. Channel sinuosity	The bands if I increase the si- length 3 to 4 to konger than if it straight line. (I channel brain considered non coestai plains tow-lying areas parameter is no rated in these	he stri tream tres tres tres tres ng is orrai a and oil and oil s. This areas	na na her	The ben increase length 2 knger ti straight	ds in the strea the strea to 3 times han it il wa tine	stream sn s tsing asing	The ben increase 2 times I was in a	ds in the stream the stream forger that streight i	សិក្សមក ៣ ៖ ៥: ៣ ៖ ៥: ៣ ៖ ៥:	Channel strägt; wäxeway has been channelesed for a.king oistance.			
SCORE	20 19 18	17	16	15 14	1 13	12 11	10 5	8	16	5 4	32	10	
8. Bank stability (score each band)	Earlys stable of erosion or b absert or or in potential for fu problems <5 affected.	eviden vark ta ival; in ture ti of tx	: ce iture te ank	Moderal infreque of erosic over, 5 reach fo erosion.	aiy stable of, smails on mosiby 30% of be as areas of	aneas healecí erskian of	Moderat 60% of t has area tigh ero cusing N	ely Lanslai barix in re as di erosi sion pole oods.	ອຊາ ອຊາ ອີດ ເອີດ ເອີດ	Unstable many erodect areas, 'raw' areas frequent elong straight sections and bends; obvious cark skoughing; 60-100% of bank has emsional scars			
SCORE	Lefibank	bank 10 9		8	7	6	CY	4	3	2	1	C	
SCORE	Right bank	10	9	8	7	6	6	4	3	2	1	G	
9. Vegetative protection (score each bank)	More than 905 streambark so and instrations to be covered vegetation, inc trees, underst shoubs, or nor mecrophytes; disruption thro grading or mot shouse a proof africat a pain to grow nature	S of the unfaces in parts by national by n	e an we Ywe Ywe Ywe	70-90% stream covered vegetation of plastic represe evident. full plastic processory more the stable remaining	of the rank surfa by næive av, bul on s is not we ried) discu but not, aft i growin p seal extern an one ha notal planu heght ig.	ces e dass al- uption fecting cotential first first	50-70% streamb covared disruptic patches closely o vegetatio then one potential height re	of the artic susta by Vegets in obvious of bare is snopped an commi- shaft of th is paint sto empiring	oes ⊴ion ≋ alor alor alor alor alor ¥ biole	Cess than 50% of the streambark surfaces coveral by vegetation (dsr.pcin of streambark vegetation its very high: vegetation its been removed to 5 certimetes or tess in average shubble height.			
SCORE	j rej psvk	10	9	8	7	\$	\odot	4	3	Ź	[1	0	
SCORE	Fight bark	50	9	8	7	\$	\odot	4	3	2	1	0	
10. Riparian zone score (some each bank)	Witch of ripan >18 metres; h activities (i.e. r lavos, cross e not impacted t zone.	ian 200 Luman Roads, Pic) ava Uhe ripa	ie Sve anien	With c 12-39 n activite the opa annual	é nparian ; retres; hur s'have imp rian zone : ly.	ache man pacted coly	Wish o 12 meio activaiss the riper deal	(ripatian) es: husta i have im tan zore i	zone 5- 7 Rocieci a çreas	Width of ripartan zone of metres latte or no ripartan vegetation is present because of human activities.			
SCORE	Lefi bark	10	9	8 7		6	5	4	3	2	1	\bigcirc	
SCORE	Rightbark	10	9	8	7	-6	5	4	3	2	1	$\tilde{(}^{\circ})$	

TOTAL LOW GRADIENT HABITAT SCORE

Sile subject to flooding. Herafit up to 4m

AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 12

Site No.

Date 19.09.17

65-90%

35-65%

10-35%

>90%

Channel cross-sections and variables to be measured in the area around a cross section

Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at homogeneous sampling sites (generally lowland streams) and three cross-sections at helerogeneous sampling sites (generally upland streams). Where the water level at the time of sampling is at or near the water main level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0,

	Cross-section sketch		Cro	ss-section number <u></u> of		
	Chamel.		(Type (of bedform at the cross-section fle X Run Pool Cascade Other		
Bank height (m)	bank water bank.			Bankfull channel width (m)		
	The channel sketch should show in cross the water surface, watermark and bankful sufcrops and anags encountered at the pr	section the shape of the channel and include the location of f points. Also show ofter features such as bars, rocky oss section	Stream Stream	eam width at the water mark (m) $\frac{4}{4}$ m width at the water surface (m) $\frac{4}{4}$		
Bank O.5 B	Horizontal dis	iances (m)				
Vertical distance between the water surface and the water mark (m)				Vertical distance between the water surface and the water mark (m)		
Riparian zone width		Notes on cross-section measure Taken at base ho	ement kmal	Plan.		
Left bank <u> (</u> m) R	light bank <u>O</u> (m)					
Bank material Assess	% composition for each bark Left bank Right bank	Substrate composition Assess % composition in the area of bed 5m eith	er skie af	Assess in the area 5m either side of Filamentous algae cover the cross section		
Bedrock	00	Bedrock		<10% ↓/_1035% [35-65% 65-90% [>90%		
Bouider (>256mm)	5 5	Boulder (>258mm)		Periphyton cover		
Cobble (64-256mm)	<u>30 30</u>	Cobble (64-256mm)		, <a> <10%		
Pebble (16-84mm)	<u>10 10</u>	Pebble (16-64mm)	120 (ŝ			
Gravel (2-1€mm)	<u>10</u>	Gravel (2-16mm)	<u>70 (</u>			
Sand (0.06-2mm)	<u>15 15</u>	Sand (0.06-2mm)	Ø~15 [™]	√ <10%10–35%35-65%65-90%>90%		
Fines (silt and clay, <0.06mm)) $\underline{\gamma} \underline{\rho} = \underline{1} \underline{\rho}$	Fines (silt and clay <0.06mm)	075	Detritus cover		

Total 100% each

AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 13

Date

Site No.

19.09

Channel cross-sections and variables to be measured in the area around a cross section

Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at homogeneous sampling sites (generally kwilling sites and three cross-sections at beterogeneous sampling sites (generally up and streams). Where the water level at the time of sampling is at or near the water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

	Cross-section sketch		Cros	s-section number	of
			Type of	bedform at the cross-section	er
Bank height (m)	The channel sketch should show in pross	-section the shape of line channel and include the location is points, whice show other features such as bars, rocky	Strea	Bankfull channel width (m) (=total of boxes A+B+C) m width at the water mark (m)	Bank height (r
	outchips and snegs encountered at the c		Stream		
width (m)					width (m
Vertical distance between the water surface and the water mark (m)					Vertical distance between the wal surface and the water mark (m)
Diversion of a state		Notes on cross-section meas	urement		
Loff book (m)	light hook (m)				
Bank material Assess	% composition for each bank Left bank Right bank	Substrate composition Assess % composition in the area of bed 5m the cross-section.	i either side of	Asses Filamentous algae cover	s in the area 5m either side of the cross section 65-90% >90%
Bedrock		Bedrock	·)		
Boulder (>256mm)		Boulder (>256mm)		Periphyton cover	
Cobble (64-256mm)		Cobble (84-256mm)	%	<10%10–35%35-65%	65-90%>90%
Pebble (16-54mm)		Pebble (16-64mm)	\	Moss cover	
Gravel (2-16mm)		Gravel (2-16mm)	Tota	Store 10% Store S	□65-90% □>90%
Sand (0.66-2mm)	·	Sand (0.06-2mm)	[
Fines (silt and day, <0.06mm	» <u> </u>	Fines (silt and clay <0.06mm)	ر	Detritus cover	
	Tota, 100% each		-	<10% 10-35% 35-65%	65-90% >90%

AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 14

-2H Date 19.09.17 1A Site No.

Channel cross-sections and variables to be measured in the area around a cross section

Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at homogeneous sampling sites (generally lowland streams) and three cross-sections at heterogeneous sampling sites (generally up and streams). Where the water level at the time of sampling is at or near the water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

	Cross-section sketch		Cros	s-section number	of
			Type of Riffle	bedform at the cross-section	er
Bank height (m)	The channel sketch should show in artiss the water surface, watermark and bankful outgrops and shags encountered at the cr	section the shape of the chennel and include the location of points. Also show other features such as bers, rocky css section.	Strea	Bankfull channel width (m) (=total of boxes A+B+C) m width at the water mark (m) width at the water surface (m)	Bank height (m)
Bank width: (m)	Horizontal dis	ances (m)			Vertical distance between the water surface and the water mark (m)
Riparian zone width Left bank (m) _R	light bank (m)	Notes on cross-section measure	ement		
Bank material Assess	% composition for each bank Left bank Right bank	Substrate composition Assess % composition in the area of bed 5m eith the cross-section.	er side of	Assess Filamentous algae cover	in the area 5m either side of the cross section 65-90% >90%
Boulder (>256mm) Cobble (64-256mm)		Boulder (>256mm) Cobble (64-256mm)	 %	Periphyton cover	65-90% >90%
Pebble (16-64mm) Gravel (2-16mm) Sand (0.06-2mm)		Pebble (16-64mm) Gravel (2-16mm) Sand (0.06-2mm)	⊥otal {	Moss cover	65-90% >90%
Fines (sit and clay, <0.06mm) Tota: 103% each	Fines (silt and clay <0.06mm)		Detritus cover	65-90% >90%

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AUSRIVAS Physical Assessment Protocol Field Data Sheets Page 1	G2H Site No. <u>2</u> Date <u>19.09.17</u>
Date 19/09/17 Site No. 20 62H) Time 1:30000 River Name Gonnie Creek Location	Recorder's Name LL+JS
Weather Warn Schutz Rain in last week? Y [] N [V] Photograph nur Latitude: Image: March Schutz Image: March Schutz	mbers and details <u>Iphone(Leesa</u>) S, W
PLANFORM SKETCH OF SITE Including bedform types, location of cross-sections, access points, landmarks and natural or artificial channel or floodplain features. Left bank is facing downstream.	LENGTH OF SAMPLING SITE Bankfull width (m
* Platypus Sighting	Notes
* caspet phyton skin * Appropriate furthe habitant	
* Pale headed rosella	BEFORE LEAVING THE SITE, CHECK DATA SHEETS TO ENSURE THAT ALL VARIABLES HAVE BEEN RECORDED

1

Acknowledgments - The content and layout of these data sheets are derived from the sheets used in the River Habitat Audit Procedure (Anderson, 1993a), AUSRIVAS, the Index of Stream Condition (Ladson and White, 1999 and DNRE Victoria) and the River Habitat Survey (Raven et al., 1998).

Site No. _____ Date _____

	Valley shape Units Choose one category only	Local impacts on streams
Temperature	°c X Steep value	ey Sand or gravel mining Sewage effluent
Dissolved Oxygen	mg I ⁻¹ Shallow va	Illey Road River improvement works
pH	Broad valle	ey Ford / ramp Dredging
Total phosphorus	Gorge	Forestry activities
	Symmetric floodplain	cal Irrigation run-off or Other pipe outlet
Amount of Water	mi Asymmetri mi floodplain	ical
Floodplain width	Average(m)	Local landuse Choose one category for each bank Left Right
Floodplain features Choose one or more features when present Sampling site has no distinct floodplain	Scroll systems	Native forest Native grassland (not grazed)
Oxbows / billabongs Body of water occupying a former river meander, isolated by a shift in the stream	 Short, crescentic strips or patches for along the inner bank of a stream mea Splays 	med nder Exotic grassfand (lawns etc., no grazing)
channel Remnant channels Formed during a previous hydrological	Small alluvial far, formed where an overloaded stream breaks through a l and deposits material on the floodplai	in Cropped Rainfed [] [] Irrigated [] []
Flood channels A channel that distributes water onto the	Floodplain scours Scour holes formed by the concentral clearing and digging action of flowing	ted Commercial Industrial or intensive agricultural
floodplain and off the floodplain during floods	No floodplain features present Floodplain present at the sampling sit does not contain any of the above fea	te but atures

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Longitudinal extent of riparian vegetation

GZH Site No. ZA.

Page 3



Date 17.09.17

Regeneration of native woody vegetation Is the sampling site in undisturbed forest?



Overall vegetation disturbance rating

Choose one category only. Sites with valley vegetation cleared on BOTH sides, but with riparian vegetation in good condition should be scored in the high disturbance category. Words within the drawings summarise the detailed text about the state of the riparian and valley vegetation for each category.







Channel shape Choose one category only

U shaped	Flat U shaped	Deepened U shape	Widened or infilled	Two stage	Multi stage
Box	Wide box	V Shaped	Trapezoid	Concrete V	Pipe or culvert

Bank shape Choose one category for each bank Left Right bank bank Concave Convex Stepped Wide lower Wide lower

Undercut

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Factors affecting bank stability Choose one or more categories

None	X Cleared
Mining	vegetation
Runoff	draw-down
Stock	Reservoir
access	releases
Human	Seepage
access	
Ford, culvert	Flow and
or bridge	waves
Feral animals	Drainpipes
Other	
Description	

	Bank slope	e e e t e e e e	ny for or	och be	nak
	CHOOSE ONE	calego	iy tor ea	Left bank	Right bank
		Vertic 80 - 90	al		
	$\left[\sum_{i=1}^{n} \right]$	Steep 60 - 80	0		
		Mode 30 - 63	rate P	X	\Box
		Low 10 - 3(-)°		
		Flat <10⁵			
Bedro Assess	ck outcrops % of each ba	s ank cov	ered by	bedre	ock outcrops
% bedrock outcrops Left bank /S /					
		Rig	ght Ban	ik	O_{Z}
Artific Choose	ial bank pro	otectic e caleg	on mea ories	sure	s
X No	ne		Fe	enced	I stock
🗌 Fe	ence structures evee banks		Wa Wa	atering points	
Le			plantings		gs
R.	ock or wali la	ayer	Lc	igs st	rapped
🗌 Ri	p rap		to	bank	
Fe ac	enced huma cess	n	∐Co lini	ing	te channel

Other

Sediment oils
x absent light moderate profuse
Water oils
Sediment odours
Anaerobic other
Water odours
normal/none sewage petroleum chemical
Sother organic - duster lad
Turbidity (visual assessment)
Clear Slight Turbid Opaque on up bi
* * * Surface
Is water clarity reduced by:
(e.g m.ud, clay, organics) (e.g plant leachates)
Water level at the time of sampling
\Box Dry \Box No flow \Box Low \times Baseflow or near baseflow
High Flood (don't sample)
Artificial features at the sampling site $n \not A$
Choose one or more categories
Major Minor Ford Bridge Culvert Other
Description
Large woody debris Overall % cover of logs and branches greater than 10cm in diameter

Date 19.09.17

(元之丹 Site No. <u>.</u>

Page 5
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Page 6
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Date

Total should equal overs % cover of mecrophytes



is measured in the office

Page 7

GZH Site No. <u>24.</u> Date <u>19.09-17</u>

Bed compaction Choose one category only	Choose one category only	Sedin Choos			
Tightly packed, armoured Array of sediment sizes, overlapping, tightly packed and very hard to dislodge	Bedrock	Asses			
Packed, unarmoured Array of sediment sizes, overlapping, tightly packed but can be dislociged with moderate	Open framework 0-5% fine sed ment, high availability of interstitial spaces	-			
Moderate compaction Array of sediment sizes, little overlapping, some packing but can be d slodgec with moderate	Matrix filled contact framework 5-32% fine sediment, moderate availability of interstitial spaces	-			
Low compaction (1) Limited range of sediment sizes, little overlapping, some packing and structure but can be dislodged vary easi.y	Framework dilated 32-60% fine sediment, low availability of interstitial spaces	-			
Low compaction (2) Loose array of fine sediments, no overlapping, no packing and structure and can be dislodged very easily	Matrix dominated >60% fine sediment, interstitial spaces virtually absent	foila			

Bed stability rating Choose one category only

Unstable - eroding

ent angularity

one category only cobble, pebble and gravel fractions only



In the USEPA Habital Assessment on the ving pages, be sure to use the correct form for high or low gradient streams

Upstable - denositing



Unstable	- eroding	Stable	Unstable -	depositing
Severe erosion	Moderate erosion	Bed stable	Moderate deposition	Severe deposition
Streambed scoured of fine sediments. Signs of channel deepening. Bare, severely eroded banks. Erosion heads. Steep	Little fine sediment present. Signs of channel deepening. Eroded banks. Streambed deep and narrow. Steep streambed	A range of sediment sizes present in the streambed. Channel is in a 'relatively natural' state (not deepened or infilled). Bed and bar	Moderate build-up of fine sediments at obstructions and bars. Streambed flat and uniform. Channel wide and shallow.	Extensive build up of fine sediments to form a flat bed. Channel blockec, but wide and shallow. Bars large and covering most of the bed or
streambed caused by erosion.	comprised of unconsolidated (loosely arranged and unpacked) material	sediments are roughly the same size. Banks stable. Streambed comprised of consolidated (tightly arranged and packed) material.		banks. Streambed comprised of unconsolidated (loosely arranged and unpacked) material.

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USEPA Habitat Assessment Circle a score for each parameter

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HIGH GRADIENT STREAMS

Page 1 of 2

Habitat								C	ondil	tion	çate	gory									
parameter		Ð	celle	n۴		1		Good					Fair					Po	no		
1. Epifaunal substrate / available cover	Great subs epifa fish of subm tark subm tark subm tark subm tark not b	áter tha triate á triate á triataí o cover; nergeo s, cob e habr e habr av fisil núal (t tansie ransie	in 706 avours donisa nitk of lioga, ble or list and liotoni e, liogs (new l d),	e of able for afon a snage unden unden ocher i al sta isator isator isator isator isator	rd tur age s	40-70% mix of stable habitst, wel-suited for full colonisation poleritier, adaptate habitst for maintenance of populations; presence of additional substrate in the form of newstal, but not yet prepared for colonisation; (may rate at high end of scale).			20-075 moof state habitat habitat anticitizit issultian desirating substrate frequently disturbed or removed.				٢	Less than 20% stable habits, lack of habits is obvious; subside unstable of lacking					is		
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	3	7	6	5	4	ļэ	2	1	٥
2. Embeddediness	Grav totic 25% secto cobb	el coù ler par suerco reent le pro che sp	ktie av ticks unded Lageri vides (ace,	id are 0- by fis ing of aversit	e M	Grevel, cobble and boulder particles are 25- 50% surrounded by fine sediment.			Gra toj 75% sedi	rel, ca der pa : Sumo ment	bole a nticle xinde	and Slare S di By A	30- ne	Gra bou nrea sur sec	nei, Ker reih rour ime	cobo ipartă cen 75 roiest & ni.	ean des: 꽃 y fo	d Ste e			
SCORE	20	19	18	17	16	15	14	13	:2	11	10	9	ß	1	6	5	4	3	2	1	0
3. Velocity / depth regime	Al to seco deep is 40 >0.5	un veš nes pr :, slos :, tas)- : 3a/s, m).	ecity/d eseni -shai: shailo , desp	epth (skowr- wr fas w), Si is	t- 044	Only 3 of the 4 regimes present (if test-shearow is missing, score lower than f missing other regimes).			Only 2 of the 4 habitat regimes present (7 fas)- shallow or slow-shallow are missing, score low).				1 3	Econinated by 1 velocity/depth regime (usually slow-deep).							
SCORE	20	19	18	17	16	15	54	13	12	11	10	9	8	7	6	5	4	3	2	1	0
4. Sediment deposition	Lihke is an less i affec depo	iorno dsior; then 5 ted by silien	erkang poèrk b 15 of 1 1 Sedin	jamen iars an he box nant	Lot Id Ions	Sort bart from sedi beth dep	ie nea kome in grav ment; om af sitor	rinché tars, m el, sar 5-304 lected air: po	esse ir nasoly nd or f is of tr is sight ois.	re e	Vederate repesition of new gravel, sand or line sectinest on old and new bars, 30-50% of the bottom affacted, sectiment dispusits at obstructions, constitutions and bends; moderate deposition in				x ne the ds; n	nativy deposition in an analysis of the second seco				37 92	
SCORE	20	19	58	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
5. Channel flow status	Wata Doth minin chari expo	er reac lower mal an mei su sed	ches b barsks nount i chstrat	ase of and of e is		W3 343 525 500	ier fills lable i Si of i strate	: :>758 Chann thann is cop	6 of th et or el osed	ē	Wat avaž anci arei	er fills able o for riff mostie	: 25-7 thann le suit r eigid	5%5 of el, strate sed.	ihe s	Vər cha pre poc	y Ett svare sent ss	Le wa Land Las s	: ter in most tarxti	l By ng	
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	з	2	1	0
6. Channel atteration	Cha cred miră rom	nanešija iging a meči st neš par	alion (x bsent bream (bern,	r er with		Some channelization present, issuely in arress of bridge abdiments, exidence of goal channelization, i.e. drefiging (greater Chan 20 yr) may be present, but recent channelization is not			Channelization may be extensive entransmission or shoring sinchines preservices on both backs; and 40 to 60% of stream reach channelized and disrupted.					Bartis shored with gabien or cerrent, over 80% of the stream reach Channetzed and discupied. Insteam habits greatly aftered or removed entirely.				í cř			
SCORE	20	19	15	17	16	15	14	13	12	11	10	9	8	17	6	5	4	3	2	1	0

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Continued over

AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 9 Date _ Site No.

USEPA Habitat Assessment Circle a score for each parameter

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HIGH GRADIENT STREAMS

Habitat		Condition category																		
parameter		Ex	celt	ent				Good			-	Fair					Расн			
7. Frequency of riffles (or bends)	Occurrence of itfles relatively frequent, ratio of distance between riffles divided by witch of the stream <7:1 (generally 510 7) variety of hebital is hey. In streams where offles are continuous, placement of bouiders or other large, relatel costruction is important.			Occurrence of offles infrequent; distance between rifles divided by the width of the stream is between 7 to 15.				Occasional rifle or bend: batism cardious provide some habital; dottance between tiffes dokied by the width of the stream is between 15 to 25.				Generally all flat water or shalow rifles; poor halorat of slance between rifles civiled by the width of the stream is a ratio of >25.				E				
SCORE	20	19	18	17	15	15	14	13	12	11	10 9	3	7	6	5	4	3 2		1	0
8. Bank stability (score each bank)	Bark of en abse pote prot affec	ks star csion 4 et or 1 ntal 10 lenas ded.	de; e orta nizin riut <5%	viden nk ta naî, k na na na na na na na na na na na na na	ence Moderalely state; taking infrequent, strail areas take of encoder mostly heated over, 5-30% of bank in f bank react has areas of encoder				Voderately unstable; 30- 60% of bank in reach has areas of erocion, high erosion potentia during foods.				Linstable many ended areas; 'rew' areas trequent along straight sections and bends; obvious bank skaughing; 60-100% of bank has contained areas							
SCORE	Lea	bank		10	9	8		7	Τ	6	5	4] :	1	2	2	1		Û	
SCORE	Rigi	ni ban	ik (ŧQ	9	8		7	Т	6	5	4]	1	1	2	1	-	0	
9. Vegetative profection (score each bank)	kloce sines and zone vegs tress sinu maci disn, grazi mini aino la gr	e than amban immed cover scover skelon skelon ing or mai or ski ali ji ow na	905% k su ied b indi arsto arsto can bian ibian fiant sual	of the races rispanic y ratio ucing ucing espeta speta	e i i i i i i i i i i i i i i i i i i i	70.005 of the streambark surfaces covered by name regestion, but one class of parts is not well- tepresented, disruption endert but not affecting full plant growth potential to any great ectent, more than one han of the potential plant stubble height			s dass ion ing artia of	S0-70% streamb covered dsnopbi patches closely (vegetati than on potentia height m	51	streambank suffices covered by vegetation disruption of streambank vegetation is very high vegetation has been removed to 5 confineties or less in average stubble height.					*			
SCORE	Left	benk		10	9	8		7	Ι	-6	5	4		3		2	1		0	1
SCORE	Figl	hl ben	* Î	10	9	\$	ĺ	7	Ī	6	5	4		3	2	2	1		Ð	
10. Ripazian zone score (score each baak)	YVdi >1S activ iasci not i zone	lh of ri metre files (i is, cro icipaci s	paria s; ho i.e. ti ps el ied ti	n zon man xads, c.) ha xe riga	ie Sve Star	Wotch of rigarian zone 12-18 steffres, human activities have impacted the rigarian zone only minimally.			ne an ched iy	Width of spar an 2019 6- 12 matres; human activities have impacted the ribarian zone a great deal.				Worth of spenian zone «Simetres, little or no riparian vegetation is present because of human activities.						
SCORE	Left	bank	Τ	10	9	8	ĺ	7	Τ	6	5	4		3	:	2	1	Τ	0	
SCORE	Figl	ht ben	١ĸ	10	9	: ₁ 8	ļ	7	t	6	5	4		3		2	ĩ	1	¢	-

TOTAL HIGH GRADIENT HABITAT SCORE



Page 2 of 2

AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 10 Site No. (f_2H ZA_{a} Date $\underline{19.09.1}$ 7

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AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 11 Site No. ______ Date _____

USEPA Habitat Assessment Circle a score for each parameter

LOW GRADIENT STREAMS

Page 2 of 2

Habitat		Condition category											
garameter	Excel	lent			Good			Fair			Poor		
7. Channel sinuosity	The bands in t increase the s engin 3 to 4 fb orger than ? i straight Sine. (F channel braida considered no coastal plains ow-lying areas parameter is n rated in these	he stri treach treach (was i Hote Ng is and ou s. This ou ease areas)	sam c.a h her S žy	The bends in the stream increase the stream length 2 to 3 tanes longer than if it was in a straight line.			The ban increase 2 times was in a	ets in the : the strea longer tha i straight i	steam en 1 lo en é il me	Channel straight waterway has been channelized for a long distance.			
SCORE	20 19 18	17	16	15 14	13	12 11	(10) 3	8	3 E	5 4	3 2	ĩ O	
8. Bank stability (score each bank)	Barks stable; af exosion or b absent or mini potential for tu problems. </td <td>eviden ank fa mal, 8 kure % of 5</td> <td>ce dure te ant</td> <td colspan="3">Voderately stable; I streguent, small areas of erosion mostly headed over. 5.30% of bank in resch has areas of erosion.</td> <td>Moderal 50% of 1 has are: high ero during 5</td> <td>iely un<i>stat</i> bank in re as of erosi sion poies boods.</td> <td>oke 30- act. act. act. act.</td> <td colspan="4">Unstable; many eroded greas; 'raw' areas hroquent along straight, seetions and pends; dovious bank steoryting; 50-100% of bank has groverne grant</td>	eviden ank fa mal, 8 kure % of 5	ce dure te ant	Voderately stable; I streguent, small areas of erosion mostly headed over. 5.30% of bank in resch has areas of erosion.			Moderal 50% of 1 has are: high ero during 5	iely un <i>stat</i> bank in re as of erosi sion poies boods.	oke 30- act. act. act. act.	Unstable; many eroded greas; 'raw' areas hroquent along straight, seetions and pends; dovious bank steoryting; 50-100% of bank has groverne grant			
SCORE	Leiltark	10	9	8	A	6	5	4	3	2	1	5	
SCORE	Right bank	10	9	. В	G	Б	5	4	3	2	T	Û	
9. Vegetative protection (score each back)	More than 90° st teambark so and immediate aone covered veget storn, ino trees, underso shutts, or no macophyles; disruption thro grazing or mov manienal or not simost all plan ito-grow nature	S of the infaces riparia by cab auding orey twood woges woge	e San Ve Store Store	70-90% streamb covered vegetali of plants represen evident i full plant in any sy more th ihe pote stubble remainin	of the lark surfa by native on, but on its not we reat; dish but not at growth p reat exter an one ha note ha height height	ectass ectass et ectass et ecting ecting ecting it of it of	55-70% streamb covered Garupti/ patches closely i vegetati than org potentia height in	of the ank surfa i by vegat of bare s of bare s cropped on comme e-rait of th plant stu e-raiting	ces ston; ;; citor citor citor citor bisie bisie	Less draft convoir lie stract bark surfaces povered by vegetation disruption of streambank vegetation is very "sigt: vegetation has been reamoved to 5 centimetres or less in average stubble height.			
SCORE	Leftbank	10	9	B	7	\odot	5	4	3	2	1	0	
SCORE	Rightbark	10	9	8	7	O	5	4	3	2	1	0	
10. Riparian zone score (score each band)	With of ripari >18 metres, h activities (i.e. r tawns, crops of not impacted f zone.	ian zon uman rcaús, tra (ha tra róga	ie ne inan	With of riparian zone 12-18 metres; human activities have impacted the riparian zone only minimally.			Width o 12 a st activitie the ripa deal	f riparian : es; Ruma s have iraj fan zone :	zone 6- n pacted a great	Width of riparian zone <8 metres; 12:16 of no riparian vegetation is present because of human activities			
SCORE	Leftbank	10	9	8	7	6	\$	4	3	2	\bigcirc	¢	
SCORE	Right bank	10	9	8	7	6	5	4	3	2	$\overline{\Omega}$	с	

TOTAL LOW GRADIENT HABITAT SCORE



Site No. G2H 2A. Date 19.09.17

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Channel cross-sections and variables to be measured in the area around a cross section

Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at homogeneous sampling sites (generally lowland streams) and three cross-sections at heterogeneous sampling sites (generally upland streams). Where the water level at the time of sampling is at or near the water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

Cross-section sketch		Cros	s-section number of
		Type of	bedform at the cross-section
Bank height (m) The channel sketch should show in cross the water surface, watermark and bankful avtorops and snags encountered at the or	Section the shape of the channel and include the location of ports. Also show ofter features such as bars, rocky assisted an	Stream	Bankfull channel width (m) (=total of boxes A+B+C) m width at the water mark (m) Sm A width at the water surface (m) Sm
Bank Horizontal dist width (m) B Horizontal dist Vertical distance O·3			Image: Second stance Image: Second stance
water mark (m)	Notes on cross-section measurer	nent	surface and the water mark (m)
Left bank $\underline{\mathcal{U}}$ (m) Right bank $\underline{\mathcal{U}}$ (m)			
Bank material Assess % composition for each bank Left bank Right bank	Substrate composition Assess % composition in the area of bed 5m either the cross-section.	side cí	Assess in the area 5m either side of Filamentous algae cover the cross section 10% <10%
Bedrock <u>20</u> <u>0</u>	Bedrock 3	<u>>1-</u> }	
Boulder (>256mm) $51 - 57$	Boulder (>256mm)	_	
$\frac{1}{1000} \frac{1}{1000} \frac{1}{10000} \frac{1}{10000000000000000000000000000000000$	Cobble (64-256m.m)		<10% ⊠10–35%35-65%65-90%}>90%
Peddle (15-54mm) $(10^{-5})^{-1}$ $(10^{-5})^{-1}$	Pebble (16-64mm)		Moss cover
Sand $(0.06-2mm)$ in $\begin{bmatrix} 0.06-2mm \end{bmatrix}$	Gravel (2-16mm) <u></u>		<10%
Fines (sill and day, <0.06mm) $ 5' $ $\frac{1}{5'}$	Eines to it and along 40 08mm)	<u>ar</u>	
	i mea tak ano day 90.00mm,()	<u> </u>	

AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 13	
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Site No.

Date

Channel cross-sections and variables to be measured in the area around a cross section

Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at homogeneous sampling sites (generally lowland streams) and three cross-sections at heterogeneous sampling sites (generally upland streams). Where the water level at the time of sampling is at or near the water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

	Cross-section sketch		Cross	s-section number	of
			Type of Riffle	bedform at the cross-section	ær
Bank height (m)	The charged sketch should show in cross the water surface, watermark and bankful purchops and snags encountered at the or	section the shape of the charactil and include the location of I points. Also show other features such as bars, rocky bas section.	Strea Stream	Bankfull channel width (m) (=total of boxes A+B+C) m width at the water mark (m) width at the water surface (m)	Bank height (m)
Bank width (m)	Horizontal dis				Vertical distance between the water surface and the
water mark (m) Riparian zone width	Yorks knowledge (ma)	Notes on cross-section measu	rement		water mark (m)
Bank material Assess	Kigni Dank (m) % composition for each bank 1.eft bank Right bank	Substrate composition Assess % composition in the area of bed 5 m e the cross-section.	ither side of	Asses Filamentous algae cover	s in the area 5m either side of the cross section 65-90% >90%
Bedrock Boulder (>256mm) Cobble (64-256mm)		Bedrock Boulder (>256mm) Cobble (64-253mm)]	Periphyton cover	
Pebble (16-64mm) Gravel (2-16mm) Sand (0.06-2mm)		Pebble (16-64mm) Gravel (2-16mm) Sand (0.06-2mm)		Moss cover	65-90% >90%
Fines (sit and clay, <0.56mm	ا) Total 100% each	Fines (silt and clay <0.06mm))	Detritus cover	65-90% >90%

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Channel cross-sections and variables to be measured in the area around a cross section

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Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at homogeneous sampling sites (generally lowland streams) and three cross-sections at beterogeneous sampling sites (generally upland streams). Where the water level at the time of sampling is at or near the water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

[Cross-section sketch		Cros	s-section number of	
			Type of	bedform at the cross-section	
			Riffte	Run Pool Cascade Cother	
				Bankfull channel width (m) (=total of boxes A+B+C)	
Bank height (m)			Strea	am width at the water mark (m)	it (m) T
	The charmel sketch should show in cross he water surface, waters and banktu accrops and snags encountered at the c	-section the shape of the channel and include the location of inpoints. Also show other features such as bars, rocky rass section.	Stream	width at the water surface (m)	1
Bank width (m)		lar.ces (m)		Bank width	(m)
Vertical distance between the water surface and the water mark (m)	Vertical water	depths (cm)		Vertical distant between the w surface and th water mark (m	ice vater ie
Riparian zone width Left bank (m) Rid	ubibank (m.)	Notes on cross-section measur	rement		-
Bank material Assess %	composition for each bank Left bank Right bank	Substrate composition Assess ½ composition in the area of bed 5m eit the cross-section.	lher side of	Assess in the area 5m either side of Filamentous algae cover bite cross section <10% 10-35% 35-65% 65-90% >90%	
Bouider (>256mm)	<u> </u>	Bedrock	— Ì	Periphyton cover	
Cobble (64-255mm)		Cobble (64-256mm)		10% 10-35% 35-65% 65-90% >90%	J
Pebble (16-64mm)		Pebble (16-64mm)			
Gravel (2-16mm)		Gravel (2-16mm)	렬		
Sand (0.06-2mm)		 Sand (0.06-2mm)		☐<10% [10-35% [35-65% [65-90%]>90%	1
Fines (sitt and clay, <0.06mm)		Fines (silt and day <0.05mm)]	Detritus cover	
	Total 100% each		,	<10% 10-35% 35-65% 65-90% >90%	J

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AUSRIVAS Physical Assessment Protocol Field Data Sheets	Page 1	Site No. <u>3A</u> Date <u>19.09.17</u>
Date <u>19.09.17</u> Site No. <u>3A</u> Time _	1645	Recorder's Name 12 + JS
River Name Cocation C Weather $Fixe + sung$ Rain in last week? Y [] N [] Latitude: deg min sec Latitude: deg min sec GPS Name and Datum Sik SA	Photograph numbe	ers and details <u>kaks Leess's ishone</u> U.E.S.W.
PLANFORM SKETCH OF SITE including beform types, location of cross-sections, access points, landmarks and natural or artificial channel or f Left bank is facing downstream. Refer to photos. Adjacant to Prices area. (TSRC	encino zone)	LENGTH OF SAMPLING SITE Bankfull width

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Acknowledgments - The content and layout of these data sheets are derived from the sheets used in the River Habitat Audit Procedure (Anderson, 1993a), AUSRIVAS, the Index of Stream Condition (Ladson and White, 1999 and DNRE Victoria) and the River Habitat Survey (Raven et al., 1998).

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Site No. _____ Date _____

PASIC WATER CHEMISTON			
Son Sucher WEISTRY	Units	Choose one category only	Local impacts on streams Choose one or more categories and describe the detail of each
Temperature	°C	Steep valley	Sand or gravel mining Sewage effluent
Conductivity			Other mining
Dissolved Oxygen	mg l ⁻¹	Shallow valley	River improvement works
Dissolved Oxygen Sat.	%		Bridge / culvert / wharf Water extraction
рН		Broad valley	Ford / ramp Dredging
Turbidity			
Total phosphorus			Forestry activities
Total nitrogen			Sugar mill Recreation
		Symmetrical	Inigation run-off or
Amount of water	ml		pipe outlet
Amount of H ₂ SO ₄	ml	Asymmetrical	Adjust to rail conduct + Alinus TSEC
		floodplain	
	111Y 1		Local landuse
			Choose one category for each bank
		Average (m)	Left Right
Floodplain features			
Choose one or more features when present	— a		Native grassland (not grazed)
Sampling site has no distinct floodplain		roll systems art crescentic strips or paiches formed	Grazing (native or non-native pasture)
Oxbows / billabongs	alo	ng the inner bank of a stream meander	🔀 🗹 Exotic grassland (lawns etc., no grazing)
meander, isolated by a shift in the stream	Sp	lays	Forestry Native [] [] Pine [] []
channei	Sm	all alluvial tan formed where an erloaded stream breaks through a levee	Cropped Rainfed [] [] Irrigated [] []
Formed during a previous hydrological	and	deposits material on the floodplain	Urban residential
regime. May be infilled with sediment		odplain scours	Commercial
Flood channels	cle	aring and digging action of flowing water	Industrial or intensive agricultural
floodplain and off the floodplain during	No	floodplain features present	Recreation
1.00đs	Flo dor	odplain present at the sampling site but es not contain any of the above features	Other

Page 3

Site No. \underline{SA} Date



Overall vegetation disturbance rating

Choose one category only. Sites with valley vegetation cleared on BOTH sides, but with riparian vegetation in good condition should be scored in the high disturbance category. Words within the drawings summarise the detailed text about the state of the riparian and valley vegetation for each category.







U shaped Deepened U shape Flat U shaped Widened or infilled Two stage Multi stage V shaped Trapezoid Box Wide box Concrete V Pipe or culvert

Bank slope

Bank shape

Choose one category for each bank



Factors affecting bank stability Choose one or more categories

None	Cleared
🗌 Minina	vegetation
Runoff	Irrigation draw-down
Stock access	Reservoir releases
Human access	Seepage
Ford, culvert	Flow and waves
Feral animals	Drainpipes
Other	
Description	

	Choose one	category for ea	ach bank	
			Left Right bank bank	
		Vertical 80 - 90°		
	$\left[\sum \right]$	Steep 60 - 80°	0 Ø	2
		Moderate 30 - 60°	V D	
-		Low 10 - 30°		
		Flat <10 ⁴		
Bedro Assess % bed	ck outcrop % of each ba rock outcrop	s ank covered by os Left bank	bedrock outcrops	
		Right Bar	nk	
Artific Choose	ial bank pro	otection mea	sures	
VNO	ne	E F	enced stock	
Fe	nce structur	atering points		
Le	vee banks	lantings		
R	ock or wall la	ogs strapped		
Rij	p rap	bank		
Fe] Fe ac	enced huma cess	oncrete channel ing		
Ot	her			

Page 5 Site No. 3A Date 19.09.17
Sediment oils
Water oils Inone Iflecks Iglobs Isheen Islick
Sediment odours Mormal/none sewage petroleum chemical Manaerobic other
Water odours normal/nonesewagepetroleumchemical fother
Turbidity (visual assessment) ☐ Clear Slight Turbid Opaque ↓ ↓ ↓ Is water clarity reduced by: ↓ Suspended material Dissolved material
(e.g muc, clay, organics) (e.g plant leachates) Water level at the time of sampling
Dry No flow Low Baseflow or near baseflow High Flood (con't sample)
Artificial features at the sampling site Choose one or more categories
Major Minor Ford Bridge Culvert Other weir Description <u>coverhead</u> pipelite
Large woody debris Overall % cover of logs and branches greater than 10cm in diameter% Notes on visibility

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Site No. <u>3A.</u> Date <u>19.09.17</u>



is measured in the office



Total should equal overall % cover of macrophytes

Page 7

Site No. <u>3A</u> Date <u>19.09.17</u>

Bed compaction	Sediment matrix
Choose one category only	Choose one category only
Tightly packed, armoured Array of sediment sizes, overlapping, tightly packed and very hard to dislodge	Bedrock
Packed, unarmoured Array of sediment sizes, overlapping, tightiy packed but can be dislodged with moderate	Open framework 0-5% fine sediment, high availability of interstitial spaces
Moderate compaction Array of sediment sizes, little overlapping, some packing but can be dislodged with moderate	Matrix filled contact framework 5-32% fine sediment, moderate availability of interstitial spaces
Low compaction (1) Limited range of sediment sizes, little overlapping, some packing and structure but can be dislodged very easily	Framework dilated 32-60% fine sediment, low avai ability of interstitial spaces
Low compaction (2) Loose array of fine sediments, no overlapping, no packing and structure and can be dislodged very easily	Matrix dominated >60% fine sediment, interstitial spaces virtual y absert

Bed stability rating Choose one category only

Unstable	- eroding	Stable	Unstable - depositing					
Severe erosion	Moderate erosion	Bed stable	Moderate deposition	Severe deposition				
Streambed scoured of hine	Little fine sediment present. Signs	A range of sediment sizes present in the sharehold.	Moderate build-up of fine sediments	Extensive build up of the seaments				
deepening Bare severely erodert	lor channel deepening. Eroded	ine sueambed. Channel is in a Irelative'v natural' state (not	Streambed flat and uniform	but wide and shallow Bars large				
banks. Erosion heads. Steep	narrow. Steep streambed	deepened or infilled). Bed and bar	Channel wide and shallow.	and covering most of the bed or				
streambed caused by erosion.	comprised of unconsclidated	sediments are roughly the same		banks. Streambed comprised of				
	(loosely arranged and unpacked)	size. Banks stable. Streambed		unconsolidated (loosely arranged				
	material	comprised of consolidated		land unpacked) materiat.				
!		material.						

Sediment angularity

Choose one category only Assess cobble, pebble and gravel fractions only



In the USEPA Habitat Assessment on the following pages, be sure to use the correct form for high or low gradient streams



AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 8 Site No. _____ Date ____

USEPA Habitat Assessment HIGH GRADIENT STREAMS Page 1 of 2 Circle a score for each parameter

Habitat Condition category parameter Excellent Good Fair Peer Greater than 70% of 1. 40-70% mix of size 20-40%) mix of stable. Less than 20% stable substrate feverable for hoortes; well-surfed for habiat habiai Epifaunal habilal; lack of habits; is epriaure coortsation and *al coorisation නැමැන්වර්ග සිංහ රානා obvious: substrate substrate / high cover, mix of snags, polentat, atequate deservable; substrate unstable or lacking. available cover submested logs, underout havitat for trainlenence. frequently disturbed or banks, cooble or other of populations; presence removed. stable hatchest and as slage of additional substrate in notes index to the colorisation the form of newfail, but potential (Le. logs/snacs not wet precared for that are not new feel and edenisation (may rate at nd transen). high end of scale). SCORE 20 19 18 17 16 15 14 13 12 5 4 3 2 1 15,10 3 3 17 a 2. Gravel cobole and Sravel, cottide and Gravel, cobble and Statel, cooble and bouider particles are D-Embeddedness boulder particles are 25bouider particles are 50soulder particles are 25% straunded by fine 50% surrounded by fine 75% surrounded by fine more than 75% sectment. Layering of sectment. sectment surrounced by fine cobile provides diversity sedment. of niche space SCORE 20 19 18 17 16 15 14 13 12 11 10 9 8 7 5 4 3 2 1 D 1. Dairy 3 of the 4 regimes At four velocity/dap() Cray 2 of the 4 habitat Dominated by 1 regimes present (slowpresent (f løst-shakew is recentes present (il fast-Velocity / depth velocity/depth_recime deed slow-shallow, tast-TESSING SCORE OWER si each or slow-sharew (USISEY SOM-CEEC). regime deep [ast-shadow]. Slow than if missing other are missing, store kow), is <0.3m/s, deep is regimes). >0.5m). SCORE 20 59 18 17 16 15 14 13 12 11 10 9 8 7 5 4 3 2 1 0 Little or no enlargement of 4 Some new increase in Moderate deposition of Heavy deposits of fine Sediment islands or point bars and ടെ (നേളിന, പടിറ്റ new gravel, sand or free material, accessed bar development; arore tiran less than 5% of the bollocal tion orevel, sand or the sectment on ohr and deposition effected by sedment sediment; 5-30% of the new bars; 30-50% of the 50% of the bottom reposition bolium affected sücht bottom affected; changing frequently; deposition in peols. sedment deposits at pools almost assent oue distructors, to substancial sectioner L constrictions and bends; dependent moderate deposition in poors prevaient. SCORE 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 Water reaches bese of Water fils 25-75% of the 5. Water file >75% of the Very Stie water in both lower banks, and available channel; or available channel stamel and mostly Channel flow in true ne le mitém <25% of channel and/or riffe substrates present as standing status channel substrate is substrate is exceed. are mostly exposed DODIS. ecced SCORE 20 19 18 17 16 15 14 13 12 11 10 9 8 7 5 4 3 2 1 0 6 6. Charneleation or Some channelization Charaneization may be Barks shored with directioning absent or រាននារ ភេរេសំខាងមន cabion or comment, over Channel edensive embaryments menimal, stream with of bridge abusinersis; or shoring structures 80% of the stream reach alteration normal patient. evidence of past present on both cards; charrelized and starreizzen, i.e. and 40 to 80% of streets disrupted, insteam dreising (creater than reach channelized and habitat greatly abered or 20 yr) may be oresent. cis upted removed entirely. but recent channelization is not present. SCORE 20 19 18 17 16 15 14 13 12 11 10 9 a | 7 6 5 4 3 2 1

Continued over

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AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 9 Site No. ______ Date _____

USEPA Habitat Assessment Circle a score for each parameter

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ssessment HIGH GRADIENT STREAMS

Page 2 of 2

Habitat			-					0	Co	nditian	cate	រៀប	y								
parameter		£x	cell	ent				Geod	4				Fair		-	Paor					
7. Frequency of rifiles (or bends)	Oca. relation of du reflex (gen of he stress conti of ho ison ison	Occurrance of inflaes relatively insquent, ratio of distance between rifles divided by withh of the stream 47-1 (generally 5 to 7), variety of hadrait is key. In streams where rifles are continuous, placement of boulders or other large, natural discloration is important. 20 19 18 17 16					Occumence of riffes infrequent distance between riffes divided by the witch of the stream is between 7 to 15.				Occ Son Son Set Sof Ster 25.	Generally all fas water or shallow infrast poor hebriat, dislance between collise divided by the width of the stream is a ratio of >25									
SCORE	20	19	18	17	16	15	14	† 3	1	12 11	10	9	8	7	6	5	4	3	2	1	0
8. Bank stability (score each bank)	Banks stable, evidence of erosion or bank takine absent or ministral, little potential for future problems, <6% of bank effected.			Rocerality stable; intropact, small areas of anoson mostly heated over. 5-30% of bank in reach tasa areas of erosion.				Voderately unstable, 30- 60% of bank in reach "as aness of ecotion, "sigh erosion, potential during Roods.					Unstable many ended areas; 'rew' areas ' frequent along straight sections and benits; obvious benit strongfring; 60-100% of bank has anstoned scraw								
SCORE	Let	bank		10	Ê	\$		7	1	6	5		4	Ī	3	2		· ·	1	-	Ò
SCORE	Rig	nl bar	ık	10	9	\$	ī	7		6	5	t	4	Ť	3	2			1		Ũ
9. Vegetative protection (score each bank)	Ware than 50% of the streambank surfaces and immediate rigosian zone covered by native vegetation, including intess, understrang shrubs, or non-woody macrophysis, vegetative disruption through grading or moving minimal or not exident almost all plants adoved			70-90% of the streambark sufficies covered by native vegetation, but one class of persis is not well- represented disruption evident but not affecting is plant growth patential to any great extent; more than one has fol- the coentral plant subble height.					50-71% of the streambark surfaces covered by vegetation, disruption dovicus, patches of bare sol or cleasely copyred vegetation common; less then one-half of the polential plant studie height remaining.					Less tran 50% of the streambark surfaces covered by vegetation disruption of streambark vegetation has been removed to 5 certimetres or less in average stubble height							
SCORE	દાહી	bark	: [10	9	ļ \$: [7		6	5		4		3	2		<u>ا</u>	1		3
SCORE	Pigt	nt bær	×	10	9	. 3	- [7		6	5		4		3	2			ſ		Ď
10. Riparian zone score (score each bank)	Vid >18 activ taxa not i zone	Wigh of sparsan zone >15 metres; human activities [i.e. staads, lavors, crops etc.] have not impacted the opanian			With of ripenen zone 12-18 metres; hurden advites have impacted the riperien zone only minimally.				Vaisch of riparian zone 6- 12 metres, human activeties have impacted the rigarian zone s preat cest.					Wigh of fipenan zone <5 metres, title or no ripasian vegetation is present because of buccan activities.							
SCORE	Left	tark	i	10	9	B		7	ĺ	6	5		4	l	3	2			1		0
SCORE	Fågt	ıt bar	*	10	9			7		6	5	Ť	4	Ť	3	2		1	1		0

TOTAL HIGH GRADIENT HABITAT SCORE



AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 10 Site No. <u>2A</u> Date <u>19.09.17</u>

USEPA Habitat Assessment

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LOW GRADIENT STREAMS

Habitat				_				C	Cond	itio n	cate	-go r	1								
parameter		Ex	celle	កើ			ć	Sco	1				Faír			Paar					
1. Epifaunal substrate J available cover	Seisen u an ocro to substrate taxourable for apfaunai colonitation and fish caver, mor ol snags, subrenged logs, under ut banks, cobble an other stable hadvat and as stable hadvat and as stable to advertisat other with and not vanishift.					30-50% mix of stable habbat well-suited for habbat well-suited for habbat for maintenance of populations; presence of additional substrate in the form of newfall, lost not yet prepared for colonisation (may rate at high and of scale).				10-3055 mm of stable Tabits; habits availabity leas than desirable; substrate frequency disturbed er removed.					Less than 10% stable hebrast lack of hebrast is obvious: substrate unstable or lacking.						
SCORE	20	19	18	17	16	15	14	13	12	11	10	\$	Đ	7	9	5	4	3	2	1	Ċ
2. Pool substrate characterization	Vicu Trater and fi Tool a Subm corra	ne of : Nais, n I ais Nais a Nais a Nais a Nais a Nais a	subsi with g and pa and and d veg	rzie Kavel revzie elecio	ກL: ວ	Mba mud be d mat vege	ure of the risk forminal shand elador	soft s ay, mu ant; so subm press	iand, idir:aj imeiro erged ant	/ 67. :	Alin colt: nati veçs	nud ar om: kt . no:s: station	idayı Beori Lorser	or san ng rog ged	id H	He ve	nd-pa drock gelat	an da Cino I Cino Cino	ay ar Icot r	nai c	x
SCORE	20	19	18	17	15	15	14	13	12	11	10	9	8	\mathfrak{D}	6	5	4	3	2	1	0
3. Pool variability	Sven stak smal deep	mix c w, ia shail pcois	ki≊ng nge-ci cxvis pres	ie- eec. mas- eril		Maj deg	arty o p: venj	f pools Hear s	s large shallov	¥.	Sha non Seep	Sow prev a prev > pools	ogis m alemi S.	iuch Uitan		시 sh	i jorky alow	of po or po	coits s cols a	7765 1687	یہ عد
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	\$	7	6	5	4	3	\odot	1	0
4. Sediment deposition	Littler of ista and k potton section	orno ndsu sstr nafit rent d	entar x poi ien 20 ieposi ieposi	genk of bar Ofk of by Bion	л 5 Шж	Som bar: from set bet dep	te nev fortræ i grav i mest, om att osition	vincra Son, m et, san 20-50 Iscael Istael Istael	rase in restly ad or fi 1% of 1 NS of 1 NS of 1 OS	ine ine t	Vod new seda new seda seda stst coni nod occ	larace grave mentu bars, om aff chemu Auctio larace larace s pro-	depos on old 50-80 fected depos ris. ris. ris. ris. ris. ris. ris. ris	sition o d or fa l and D is of t its al its al its al its al its al	x ne lire ds; n	84 min of 20 50 cm of 20 50 cm of 20 50 cm	avy s serial velop % of angin ols al subsi posit	lepos ment the b g free most lartia on	its of rease t mor ott ar quent abse i sec	' fine d bar e Ua Sy: ani di imen	r an ue
SCORE	20	19	18	17	15	15	14	13	12	$\widehat{\mathbb{N}}$	10	9	8	1	6	5	4	3	2	1	0
5. Channel flow status	Wate both k sinis shara expos	r cess Dener Tel an Tel so Tel so Tel so	thes i bank 1048: baire	base s, an of de is	: of 2	Wa ava <25 sub	: ler fås låble o Ki of o strate	i >755 channi tharne is exp	solft al.α a ased	<u> </u>	Wat ava) and afei	er f2s edde o for rith mostà	25-70 cheann e sub r expo	SS of el, strate sect	the i	Ve chi pre po	ny EE annei Iseni ols.	ie wa i anci es s	(er in mos), (arxti	hç İş	
SCORE	20	19	18	17	16	(6)	14	13	12	11	10	9	\$	7	6	5	4	3	2	1	0
6. Channel alleration	Chameleation or dresiging absent or minimat, stream with montral pattern.				Some channelizator present usually in arcas of bridge adumtments; entence of past channelization, i.e. develging (prest ar than 20 yr) may be present, but resert, channelization is not				Channelization may be exercisive, embandformanis or shoring structures present on both banks; and 40 to 80% of stream reach channelized and osrupted.					Earlis shoted with gabien of centent, ever 80% of the stream reach channelscort and disrupted, instream hisbits greatly attend or rectored articely.							
						char char	recent noeiza sect	: Blion i	s nol												

Continued over

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Page 1 of 2

AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 11 Site No. ______ Date _____

USEPA Habitat Assessment Circle a score for each parameter

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LOW GRADIENT STREAMS

Page 2 of 2

- - -

Habitat					Č(ondition	n catego	ory						
parameter	Excel	le nil			Good			Fair		rocg				
7. Channel sinuosity	The bends in 1 increase the s length 3 to 4 to straight She, il channel braid, considered no cossidered no cosside	he stri tream mes twas i was i was i rmalin and at and at s. This areas	eam ina ina inar s inar s	The ben increase langer U langer U straight	ics in the the stres to 3 time han fit wi line.	stream am s as in a	The ben increase 2 frmes was in a	ids in the e the stress longer the straight t	slæarn en 1 lo en ein ene	Ohennel stragtik; watarway has been thaneeteed for a long distance.				
SCORE	20 19 18	17	16	15 14	(13	12 11	t0 9	\$	ি ত	5 4	3 2	1 0		
8. Bank stability (score each bank)	Banks stable of ension on the absent on mail potential fond problems. <5 affected.	ice šure 19e ark	Vodera arfreque of erosin over, 5 teach hi erosion,	esy stable sti, smat s sn mosty -30% of b as areas (; aræs- healed arkrin n″	Modera 60% of hes are high ero during f	ley srsta bark in ra as of erosi sion pote boots	bie; 30- ach ian; mial	Unstable, many encoded areas, inav areas frequent dong straight sections and bands; obstous bank sloughing 60-100% of bank has areasynd scars					
SCORE	Left bank	10	9	: 8	Q	6	5	4	3	2	1	0		
SCORE	Right bank	10	9	8	Ð	6	5	4	3	2	1	-0		
9. Vegetative protection (score each back)	More than SP streambank s and imsedable vegetation, inc brees, underst shubs, or non matrophytes; disruption thro grazing or ma mitimal or not amos; al plar	e s ans ive l y zive ni: wed	70-90% streamb rovered vegetzi of plane represe exident his plane more th stable remani	of the lank surfa i by calve on, but on s is not even seet, cish bul ool af tu sowth p yeat exten an one ha miar plant height ng	ices e class el- si- uption tecting sotential K H of	50-70% stream covered display patches cossign vegetat than av potents beight n	of the park surfa toy vegets on obvious of bare's propped on cocorns e-half of to i plant sto e-training	noes ation; 5; 5i pr 5i pr	Less than 50% of the streambark surfaces invested by vegetation dis uption of streambark, vegetation is very high, vegetation has been removed to 5 centimetres or tess in average stubble height.					
SCORE	Leftbank	10	9	В	7	6	5	Ø	3	2	[1	٥		
SCORE	Föght bærk	10	<u>ا</u>	ß	7	6	5	\odot	з	2	1	0		
· 10. Riparian 20me score Iscore each bank	Wich of riper >38 metres; h activities (i.e. learns, crops i not impacted) cone	ne ave anar	Wigh o 12-18 n activitie the rica minimat	friparian netres; hu s have any nian zone- ty.	zone rtan parteci only	Witth o 12 met: activitie the ripa deal	f ripatian : tes; huma s have int dan zone :	zore 6- n pactad a greel	With of riperian zone <5 metres; little or no riparian vegetation is present because of human activities.					
SCORE	Left Sark	10	9	B	7	6	5	4	3	2	Q	Ð		
SCORE	Right bane	10	9	B	7	6	5	4	3	2	Ø	0		

TOTAL LOW GRADIENT HABITAT SCORE



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Site No. 3A. Date ___

Channel cross-sections and variables to be measured in the area around a cross section

Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at homogeneous sampling sites (generally lowland streams) and three cross-sections at heterogeneous sampling sites (generally upland streams). Where the water kevel at the time of sampling is at or near the water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

	Cross-section sketch		Cros	s-section number of
			Type of	bedform at the cross-section
Bank height (m)	The channel sketch should show in cross the water surface, weremark and beniful outcrops and snags encountered at the p	-section the shape of the channel and include the location of I points. Also show other features such as bars, today gas section	Strea Stream	Bankfull channel width (m) (=total of boxes A+B+C) m width at the water mark (m) width at the water surface (m)
Bank width (m) Vertical distance between the water surface and the water mark (m)	Horizontal dis	tarces (m)		Bank width (m) Vertical distance between the water surface and the water mark (m)
Riparian zone width Left bank ^{つ・t} (m)F	light bank 0.7 (m)	Notes on cross-section measurem	ient	
Bank material Assess	% composition for each bank Left bank Right bank	Substrate composition Assess % composition in the area of bed 5m either the cross-section.	side of	Assess in the area 5m either side of Filamentous algae cover the cross section
Bedrock	15 20	Bedrock	}	
Boulder (>256mm)	<u> </u>	Boulder (>256mm)	_	Periphyton cover
Cobble (64-256mm)	10 10	Copble (64-256mm)		☐ <10% 10-35% 35-65% 65-90% >90%
Pebble (16-64mm)	10 10	Pebble (16-64mm)	ļį	
Gravel (2-16mm)	<u> </u>	Gravel (2-16mm) iC-		
Sand (0.06-2mm)	10 10	Sand (0.05-2mm) 10		<10% _/10-35%35-65%65-90%>90%
Fines (sill and clay, <0.66mm) <u>- 30 - 30</u>	Fines (sit and clay <0.06mm) 70		Detritus cover
	Total 100% each		,	<10%

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AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 1	3
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Date

Site No.

Channel cross-sections and variables to be measured in the area around a cross section

Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at homogeneous sampling sites (generally towland streams) and three cross-sections at heterogeneous sampling sites (generally uptand streams). Where the water level at the time of sampling is at or near the water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

	Cross-section sketch		Cros	s-section number	of
			Type of	bedform at the cross-section	ner
Bank height (m)	The channe sketch should show in cross the water surface, watermark and bankfu	-section the shape of the channel and include the location of Locinis. Also show other leatures such as bars, rocky	Strea	Bankfull channel width (m) (=total of boxes A+B+C) m width at the water mark (m)	Bank height (m:)
	outcrops and snags encountered at the o	ous section	Stream		Bank
width (m)					width (m)
Vertical distance between the water surface and the water mark (m)	Vertical water				Vertical distance between the water surface and the water mark (m)
Rinarian zone width		Notes on cross-section measur	ement		
Left bank (m) F	Right bank(m)				
Bank material Assess	% composition for each bank Left bank Right bank	Substrate composition Assess % composition in the area of bed 5m ei the cross-section.	fher side of	Asser Filamentous algae cover	ss in the area 5m either side of the cross section 65-90% >90%
Bedrock		Bedrock)		
Boulder (>256mm)		Boulder (>256.mm)		Periphyton cover	
Cobble (64-258mm)		Cobble (64-256mm)	>	<pre><10% 10-35% 35-65%</pre>	65-90%>90%
Pebble (16-64mm)		Pebble (16-64mm)		Moss cover	
Gravel (2-16mm)		Gravel (2-16mm)	⊣ otai		□ <u>85-90%</u> □>90%
Sand (0.06-2mm)		Sand (0.06-2mm)	i		
Fines (silt and day, <0.06mm		Fintes (silt and day <3.06mm))	Detritus cover	
	Total 100% each		-	<10% 10–35% 35-65%	65-90% >90%

AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 14
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Channel cross-sections and variables to be measured in the area around a cross section

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Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at homogeneous sampling sites (generally lowfand streams) and three cross-sections at heterogeneous sampling sites (generally upland streams). Where the water level at the time of sampling is at or near the water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

Cro	oss-section sketch		Cros	s-section number	of
			Type of	bedform at the cross-section	èr
Bank height (m)	charinel sketch shou'd show in cross-se afer surface, watarttark and benktusi pr ops and snags encountered at the cross	ction the shape of the charges and include the location of ints. Also show other features such as bars, rocky section.	Strea Stream	Bankfull channel width (m) (=total of boxes A+B+C) m width at the water mark (m) width at the water surface (m)	Bank height (m
Bank width (m)	Horizontal distar				Vertical distance between the wate surface and the
Riparian zone width Left bank (m) Right	bank (m)	lotes on cross-section measure	ement		
Bank material Assess % cor Bedrock	mposition for each bank p Left bank Right bank b	Substrate composition ssess % composition in the area of bed 5m eith re cross-section. Rodrock	nersideof	Assess Filamentous algae cover	in the area 5m either side of the cross section
Boulder (>256mm) Cobble (64-258mm) Pebble (16-64mm) Gravel (2-16mm) Sand (0.06-2mm) Fines (silt and clay, <0.06mm)		Boulder (>256mm)	Total 100%	Periphyton cover <10%	65-90%>90% 65-90%>90% 65-90%>90%

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AUSRIVAS Physical Assessment Protocol Field Data Sheets Page 1	Site No. <u>94</u> . Date <u>20.09.17</u>
Date 20.09.17 Site No Time 1330 River Name Locknes Creek. Location 9A	Recorder's Name GS + LL
Weather Event Schong Rain in last week? Y [] N [X] Photograph nun deg min sec Ceg min sec Latitude: Image: Schong Longitude: Image: Schong Image: Schong Image: Schong GPS Name and Datum GA Image: Schong Imag	nbers and details <u>Leese's phone - U,E</u> ,S,U
PLANFORM SKETCH OF SITE Including bedform types, location of cross-sections, access points, landmarks and natural or artificial channel or floodplain features. Left bank is facing downstream. See Motos -	LENGTH OF SAMPLING SITE Bankfull width (m) x 10 Length of sampling site OO(m) Notes
Fauna species White found heron welcome swallows Water dragons Kainbow lowiketts Little Black commant Chenders. Hollow present ~ 30cm chametre.	BEFORE LEAVING THE SITE, CHECK DATA SHEETS TO ENSURE THAT ALL VARIABLES HAVE BEEN RECORDED

Acknowledgments - The content and layout of these data sheets are derived from the sheets used in the River Habitat Audit Procedure (Anderson 1993a), AUSRIVAS, the Index of Stream Condition. (Ladson and White, 1999 and DNRE Victoria) and the River Habitat Survey (Raven *et al.*, 1998).

Page 2

Site No. <u>9</u>A Date <u>2019117</u>

BASIC WATER CHEMISTRY	- <u>-</u>	Valley shape	l carl imposée en etreeme
see Surface water spect.	<u>Units</u>	Chocse one category only	Choose one or more categories and describe the detail of each
Temperature	°c	Steep valley	Sand or gravel mining Sewage effluent
Conductivity			Other mining Channel straightening
Dissolved Oxygen	mg l ¹	Shallow valley	Road River improvement works
Dissolved Oxygen Sat.	%		Bridge / culvert / wharf Water extraction
рН		Broad valley	Ford / ramp Dredging
Turbidity			Discharge pipe Grazing
Total phosphorus 🔲 🛱 🗠		Gorge	Forestry activities
Total nitrogen			- Sugar mill Recreation
≥ ALKALINITY		Symmetrical	Irrigation run-off or Other
Amount of water	mt		
Amount of H₂SO₄	mi	Asymmetrical floodplain	
Alkalinity	mg l ⁻¹		
			Local landuse
Floodplain width		Average <u>250</u> (m)	Left Right
Elendricio festuras		to confirm on aerial	Native forest
Choose one or more features when present			Native grassland (not grazed)
Sampling site has no distinct floodplain	Scr	oll systems	Grazing (native or non-native pasture)
Oxbows / billabongs	- Sho aloi	or, crescentic strips or patches formed ng the inner bank of a stream meander	Exotic grassland (lawns etc., no grazing)
meander, isolated by a shift in the stream	🗌 Sp	lays	 Forestry Native [][] Pine [][]
	- Sm	all alluvial fan formed where an erloaded stream breaks through a levee	 Cropped Rainfed [][] Irrigated [][]
Formed during a previous hydrological	and	deposits material on the floodplain	Urban residential
regime. May be infilled with sediment		oodplain scours	Commercial
Y Flood channels A channel that distributes water onto the	cle	aring and digging action of flowing water	Industrial or intensive agricultural
floodplain and off the floodplain during	No	floodplain features present	Recreation
Noods	Flo doe	odplain present at the sampling site but es not contain any of the above features	Other

% Cover

01

0%

i07.

26 - 50%

moderate

extensive

May total more than 100%

51 - 75%

% Native <u>107.</u> % Exotic <u>907.</u>

Page 3

Site No. <u>9</u>A

Longitudinal extent of riparian vegetation



Date 2019117

Regeneration of native woody vegetation Is the sampling site in undisturbed forest?



Overall vegetation disturbance rating

6

Extent of trailing bank vegetation

- 25%

Riparian zone composition

Assess for whole sampling site

Trees (>10m in height)

Trees (<10m in height)

Grasses / fems / sedges

Shading of channel

< 5%

ni

slight

Shrubs

Choose one category only. Sites with valley vegetation cleared on BOTH sides, but with riparian vegetation in good condition should be scored in the high disturbance category. Words within the drawings summarise the detailed text about the state of the riparian and valley vegetation for each category.

> Total 100%

Vegetation Description

wear a hotleburch

> 76%

Native and exotic riparian vegetation



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Site No. <u>9A</u> Date <u>2019117</u>



 Box
 Wide box
 V shaped
 Trapezoid
 Concrete V
 Pipe or culvert

AUSRIVAS Physical Assessment P	rotocol Field Data Sheets	Page 5 Site No. <u>94</u> Date <u>29</u> 9/17
Bank shape Choose one category for each bank Left Right	Bank slope Choose one category for each Left	Sediment oils bank Right
	Vertical 80 - 90°	Water oils Water oils Inone I flecks I globs I sheen I slick
Convex V	Steep 60 - 80°	Sediment odours
Stepped	Moderate 30 - 60°	Water odours
Wide lower bench	Low 10 - 30°	Image: Sewage in petroleum inchemical Image: Sewage in petroleum inchemical
	Flat <10°	Turbidity (visual assessment) Clear Slight Image: Slight Image: Sligh
Factors affecting bank stability Choose one or more categories None Cleared None Cleared Mining Irrigation Runoff draw-down Stock Reservoir access Human access Flow and Ford, culvert Flow and or bridge Drainpipes Other Description	Bedrock outcrops Assess % of each bank covered by bed % bedrock outcrops Left bank Right Bank Artificial bank protection measur Choose one or more categories None Fence Fence structures Veget Levee banks Veget Rip rap Logs at to bar Fenced human Concr Other Other	rock outcrops Is water clarity reduced by: O Suspended material (e.g mud, clay, organics) Dissolved material (e.g plant leachates) O Water level at the time of sampling I Dry No flow Low Baseflow or near baseflow High Flood (don't sample) Artificial features at the sampling site Choose one or more categories Clover Other ation Major Minor Ford Bridge Culvert Other weir Description Lottleft Siding Koad Cloverall % cover of logs and branches greater than 10cm in diameter Vater level woody debris Overall % cover of logs and branches greater than 10cm in diameter
· _ · · · · · · · · · · · · · · · · · ·	assonated with unde	

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Page 6
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Site No. <u>9A</u> Date <u>2019117</u>



Page 7

V

Site No. <u>9A</u> Date <u>201911</u>

Bed compac Choose one ca	tion alegory only	Sediment Choose on	t mat e cate	rix egory only
	Tightly packed, armoured Array of sediment sizes, overlapping, tightly packed and very hard to dislodge			Bedrock
	Packed, unarmoured Array of sediment sizes, overlapping, tightly packed but can be dislodged with moderate	800	04-80	Open framework 0-5% fine sediment, high availability of interstitial spaces
	Moderate compaction Array of sediment sizes, little overlapping, some packing but can be distodged with moderate		0:0:4	Matrix filled contact framework 5-32% fine sediment, moderate availability of interstitial spaces
	Low compaction (1) Limited range of sediment sizes, little overlapping, some packing and structure but can be dislodged very easily		3	Framework dilated 32-60% fine sediment, low availability of intersätial spaces
	Low compaction (2) Loose array of fine sediments, no overlapping, no packing and structure and can be dislodged very easily		Ô.	Matrix dominated >60% fine sediment, interstitial spaces virtually absent

Bed stability rating Choose one category only

Unstable	e - eroding	Stable	Unstable -	depositing
Severe erosion	Moderate erosion	Bed stable	Moderate deposition	Severe deposition
Streambed scoured of fine sediments. Signs of channel deepening. Bare, severely eroded banks. Erosion heads. Steep streambed caused by erosion.	Little fine sediment present. Signs of channel deepening. Eroded banks. Streambed deep and narrow. Steep streambed comprised of unconsclidated (loosely arranged and unpacked) material	A range of sediment sizes present in the streambed. Channel is in a 'relative'y natural' state (not deepened or infilled). Bed and bar sediments are roughly the same size. Banks stable. Streambed comprised of consolidated	Moderate build-up of fine sed ments at obstructions and bars. Streambed flat and uniform. Channel wide and shallow.	Extensive build up of fine sediments to form a flat bed. Channel blocked, but wide and shallow. Bars large and covering most of the bed or banks. Streambed comprised of unconsolidated (loosely arranged and unpacked) materia'.
_		(tightly arranged and packed)	К —	

material.

Sediment angularity

Choose one category only Assess cobble, pebble and gravel fractions only



In the USEPA Habitat Assessment on the following pages, be sure to use the correct form for high or low gradient streams



AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 8 Site No. _____ Date _____

USEPA Habitat Assessment HIC Circle a score for each parameter

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HIGH GRADIENT STREAMS

Page 1 of 2

			-																					
	Haloitat						Condition cat					category												
1	parameter		E	Delle	ni			(Gered			Fair						Poer						
	1. Epifaun al substrate J available cover	Great Suites Sui	ientra instell unal o cosert lengad s, cob e habi ov ful rifell (iu are no ransie	n 73% storis sionis: siacof liogs, ble an ist and ist	s ol able to ston a snaga under other stat sy isstion stat an al an	r nei 304 305 1 5	40-7 habi fu£ c pote habi of pute habi of pute habi tabi tabi tabi tabi tabi tabi tabi t	40-70% mixed stable habitat, well-suited for full colonisation paterial, adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonisation (may rate at					9% m 22, he 20 hy 26 k; 26 k; 26 hy 26 hy 26 hy 27 hy 26 hy 27 hy	ototis okal lessi sutet disto	stable Ihan Itali Itali Itali Itali Itali Itali Itali	r	Less than 20% stable hatkat lack of hatkat is christs substrate unstable of lacking.							
Ī	SCORE	20	13	18	17	16	15	14	13	12	11	10	5	8	7	6	5	4	3	2	1	0		
	2. Embeddedness	Grav boux 25% sedi: ccbb cf nic	el, cot ier par surror nent, le pro- the so	ible ar fictes noted Layeri ides (aca,	id are 0- by fin ing of Syssif	e Iy	Gravel cobble and cobble and cobble particles are 25- 50% surrounded by fine cobble sedanceri.					Grav Louis 75% Secto	56- ae	Gravel, cobble and boulder particles are more liten 78% sumounded by fine sediment.										
ĺ	SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	3	6	\$	4	3	2	1	Q		
	3. Velocity / depth regime	All 10 regin desp desp is 40 >0.5	ur veð næs pa , slow , fæsl- t 3m/s m).	conyk¢ esent -shats shallo , deep	ecth [s3ow- x∙, fas ⊮]. Si is	t. Ow	Oraș pres miss than regis	r 3 of 1 ent (d sing, s i i mis nes}	ine 4 d fastka care i sing t	rojsk Refu Oner L'her	\$5 ¶:Śs	Crity .regi shaž are i	(2 of 1 Tes p low or missio	he 4i resen skur g. so	haoda L (ř fe Snaik Gre io	£ SI- M∎ 6}.	Do: vek {us	trina ticity Uach	alec b Adepä A slow	y 1 h reg - Cee	ime nj.			
ĺ	SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	Û		
	4. Sediment deposition	Little islan less afen cepo	erne dsorj (han S ted by siton,	ertarg point b Si of L r sedin	gemen) lars an he bol nent	.04 xd \$0m	Sor bar from sed: betk dep	ie nev ierna I grav trat; trat; ton af sitiar	vincra bon, m sl sar 5-30% fected i in pe	ase in nostly 10 or 1 3 of 11 5 of 11 5 of 11 5 of 11	ine ne 1	Mos new sedii tota sedii abst cons mod eact	erate grave mert o bass: mert o suctio suctio suctio erate s crev	depos san ota 30-5 actec	stion o dier fi land 25 ol 35	of ine ft.e ds n	Hax des 504 cha poo lo s dep	avy i lenia leta, lis a lis a lubs kost	depos smeni the b ng fra incst tantia tantia	ies of rease to more outor outor outor outor outor outor outor outor outor	itime di bac e tha i i i i i i i i i i i i i i i i i i i	: ; ;e		
İ	SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	э	2	1	D		
	S. Channel flow status	Was both minur chan expo	er reak Ikwer Tal an Ne ^g su Sed	ches b banks sount i bstrat	ase ol ase ol and a e is	1	Wa avai (25) (00)	erfis labie (% of o strale	.>75? chann fhann is esp	softh ator al cead	R	Wat avač anđ arei	er fils ebie o for atfil mosth	25-7 tarın e sub regio	: 57.5 di el strate sed	tte s	Ver ché pre poc	y itt rate seri is	ile wa Siand Sias S	ker in most bande	ly ng			
NAME OF CASE O	SCORE	20	15	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	:	0		
	6. Channel alteration	Char cteo minin nom	netµa ging a rat; si n≊ pat	úor o tsent ream ' tern	r cr with		Som press of bi char dress 20 y but char press	e cha ert, u idge : ance: meio tyng i r, ma recen meio aneio	rmeta stratiy stration of pass storn, i gream y the p storn is storn is	azion ents ents I i.e. entha vresen srvot	אבש ו נ	Cha edition st press and read cism	naetz nsive, horing ent or 40 to b sha upred	ation : entba istruct both 80% - Gnetiz	may b anione dures i bank of stre ged an	ອ ການ S; ອກ d	Banks shored with gabion or carrant; over 20% of the stream reach charnalized and discupted, instream habital greaty altered or removed swins);					c cin or		
	SCORE	20	19	18	17	16	15	14	13	\$2	11	10	9	8	17	6	5	4	3	2	1	0		

Continued over

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AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 9
Site No. ______ Date _____

USEPA Habitat Assessment Circle a score for each parameter

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Page 2 of 2

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Γ	Habital						Condition o) category														
l	parameter		Exc	elle	ent		-	Good							Fa	ir			Poor							
	7. Frequency of riffles (or bends)	Coo relation of the s (gen- of hat subsects of ho larget is inter	uterce very in stance s divide stream eraty 5 bital s ans wh auous, utdats t, nauri soutant	e of r source between sologian item plan ar of c	riffies ni; ra weer with i i i i i i i i i i i i i i i i i i	to hot are nation	Occurrance of rifies intropent; distance between rifles divided by the width of the stream is between 7 to ; 15.					Cess both som betw by th stres 25.	ssion ora () e hal een erwi erwi erwi	e≦rá biat rffæ idhu i beb	file d urs p dist s div s div	r ta xovi anci idad 115	ret de to	Cenerally at flat water or shalow rifles; poor hebits; distance between rifles divided by the watch of the stream is a natio of >25.								
	SCORE	20	19	t0	17	16	15	14	13	1:	2 1	1	10	9	a	Ì	7	Б	5	4	3	2	1	0		
	8. Bank stability (score each bank)	Sani ol er abse pote prot affec	ies stab tosion e ant or c caial foi ferns, fleci,	le; e n be shan r fu¢ <sta< td=""><td>saden ark fai rat, id ure a of ba</td><td>ce àne He ank</td><td colspan="4">Motoralety stable: infrequent, small arress of erosion mostly hesied over. 5-30% of benk in reach has arress of erosion.</td><td colspan="7">Vioterately unstable; 30- 60% of bank in neach "as areas of erosion, "igh erosion polential during floods.</td><td colspan="7">Unstable; many erodes areas; 'raw' areas 'requent along straight sections and bends; obvicus bank skoughing; 60-100% of bank has emolocal strass</td></sta<>	saden ark fai rat, id ure a of ba	ce àne He ank	Motoralety stable: infrequent, small arress of erosion mostly hesied over. 5-30% of benk in reach has arress of erosion.				Vioterately unstable; 30- 60% of bank in neach "as areas of erosion, "igh erosion polential during floods.							Unstable; many erodes areas; 'raw' areas 'requent along straight sections and bends; obvicus bank skoughing; 60-100% of bank has emolocal strass								
F	SCORE	ાસ	bank		10	5	8 7 6				6		5 4 3					2		1	0	2				
ŀ	SCORE	Rig!	nt banl	ĸ	10	s.	8	8 7		6		5		4			3		2		1	- (2			
	9. Vegetative protection (score each back)	Man strea and and vege trea strue mac of strue disc graz and to g	e than ! amban amban e coven Xation ; Xation ; copinyl! uption ! uption ! uption ! uption ? and or mail or inst all p iow net	90% sale sale sale sale sale non sson No. No. No. No. No. No. No. No. No. No.	ed the nigetic nigetic nigetic viding wood ring sector s about hy	e san ve y stve fi wed	70-9 stree coar vego st p evid trai to a mor the stut rem	inco arriso a ar	of ine ark sur by nain sis not ut is not ut nted; de but not tot not tot not not not not not not not not not not	fao ve are snip afe are are are are	es Case Xon cing lents of	\$ al	50-7 strat distribution pate des vega than pate heig	D% smok sted special signation static one static static static	of the apply of corporation prant prant main	e sysk viola res sed res ing ing	ces alien 5, al a an; 5 he toble	r esss	ାରେ ସେଥିଲେ । ଅନ୍ୟୁ କରି କରି କରି କରି କରି କରି କରି କରି କରି କରି	sa in sant narec narec yelzsi yelzsi yelzsi yelzsi nova narec saga	an 50 an 50 on is on is on h d to 3 stat	Phi of surta regen istrea very as be to res able h	the bes stiert mba hight en sin eight	nix. ;		
Γ	SCORE	Leit	bará		10	9	8		7	l	6		5		ŝ	ŧ		3		2		1	1	۵ 		
- Harrison	SCORE	Rg	tt bar	8	10	9	8		7	T	5		5			ŧ		3		2		1		à		
Wetternet	10. Rigarian 2011e sçore (scor e each ba nk)	Nic >18 actin tawr noti 2002	tt: of no nuetres rties (i 15, crop impectie 8	sana s, hu e, no s, s et s, t	an zon Iman cac≿, ta,⊧ha he ripa	ke Ave arian	With or iscarian zone 12-13 matres; buttian activities have impacted the riparian zone only minimally.						Width of nparian zone 6- 12 πettes; homan activities have impacted the riperan zone a great deal.							With of riparian zone <5 metres; 3tle of no riparian vegetation is present because of human activities.						
ľ	SCORE	Leri	bank		10	9	6	1	3	Ì	6		5	10 A A		ŧ		1		2		1	ļ	0		
ŀ	SCORE	Rig	int bars	k	10	9	6	-	7	Í	ô		5			4	Ĩ	1		2	Γ	1	Ì	0		

TOTAL HIGH GRADIENT HABITAT SCORE



AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 10 Site No. <u>44</u> Date <u>2019117</u>

USEPA Habitat. Circle a score for e	Assessmer each parama	nt ter	l	LOV	V C	βR/	٩D	IEI	T	ST	RE	Añ	IS			F	Page	10	ıf 2
Habilat	!					C	កាត់	itinn	cate	-005	,								
parameter	Excel	fent.		-	G	iood				.31	Fair			1		P	100		
1. Epifaunal substrate / available cover	Greater than 3 substrate favo epitaunal colo and fish cove snegs, subme undercut bank or other stable and at staget (Le. logsusnag not new fait ar transiew)	0% of urable isation rged lo rged lo s, cobit habita tabita s cobit habita s cobit s cobit habita s cobita habita s bita habita	for gs. oke t foal xe	30-50 habits full co potano habits of pop of add the fo not ye coloni high a	Pis mi it, wei bioniss sia; a st for : puistic stions of pres isetion and of	ical si il-suite scan dequa mainte mainte mainte na	abie ad for sha resen shate al, bu for r naie k	e ce in 1 at	(D.3 habi arab desi freq rem	0% mi let hai ability rable: Jendy Xed	in of s bital less l subs/ dishu	stable Unan rate thes o	r	Les hab	is (n. Mat. Habi	an 10 lack : sub e or k	No si of ha strain ackin	abke bitat 9	is
SCORE	2G 19 18	17	16	15	14	13	12	0	10	9	8	7	6	5	4	3	2	1	0
2. Pool substrate characterization	Midure of suc materials, with and firm sand root mats and submerged ve common.	strate i gravel prevæk getallo	i sint, n	Visitu mud (be do mais veges	re of s or c'a _l minar and s ation j	soft sa (; anu) ti; sor uame prese	ano, 1 may 1 e roa roject nij	×	Ali n bota mat; vege	nusion Att, itt: No su Sation,	dəyi is ori bənə	or sar no rox ged	ध t	Har bec ve;	id pa Inte Resti	an dia Cirtài Iòm	iy or fact r	r.at c	
SCORE	20 19 18	17	16	15	14	[13]	12	11	10	9	8	7	6	5	4	э	2	1	0
3. Pool variability	Even mix of la shailow, large s nati-shailow, deep pools pri	içə deep, sıral- sent		klajor deep;	ity of very	pods few sl	large hažov	i.	Shai mare deep	iow po e preva o pools	ols n den; i ;	luch Ihan	-	Maj sine	jorst _i Sow	orpa	ocis : Iois a	imal bser	⊦ *L
SCORE	26 19 14	17	16	(15)	14	13	12	11	10	9	8	7	6	5	4	3	2	1	O
4. Sediment deposition	Little or no end of islands or p and less than bottom affecte sediment dep	argemi oint bar 20% of d by stitor.	ri rs Itire	Some bar fo frore : sector bottor depos	e new rmati çravel terit, j n afle stion j	increa (n, m I, sant (23-50) (జిల్లు cs:Uy కింగ్ 1 కప్పిh1 is.	he he	Moc resr satis new bota satis cost cost cost cost cost cost cost	erale o gravel mexi o bars; bars; mexi o nuction drate o s previo	iepos i, san in oid 50-81 iepos is, is, is, is, as, as, as, as, as, as, as, as, as, a	idion (dior fi land PS of its at dibea idion i	of the the cos; n	Hes mai den 80% den pot los den	ary (Ieria) Ieria Ieria Ieria Ieria Ieria Ieria	tepos I, incr the b og fre impst tartia ion	iis di ease (200 coon ques abse i sed	line diba netta n ty: nt di inten	เ สา มะ เ
SCORE	26 19 18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	t	0
5. Channel flow status	Water reache both ower bar minimal across channel subst exposed.	sbase ins, an rtof rate s	oť d	Wate asola SSS Subsi	c fils: bie ch a of cù sale is	>75% tarinel tarinel sego	of the I; or Se1.	•	Wei avai and: are r	er F31s abble d profile noosly	25-7 Nara Sub Espo	5% d el strace sect	te s	Ver cita pre poc	ny int sonel seri is.	ie wa Land as si	lerin nosi lanci	hy ng	
SCORE	20 19 18	17	16	5	14	13	12	11	10	9	8	7	6	5	4	3	2	ŧ	Q
6. Channel alteration	Charmelization dredging abse marimal, strea normal pattern	ror rolar mwith '		Some prese of brix chann dredg 20 yr but re dhann prese	shar ni, us içe al nce d veiza ing (ç ing (ç ing (ç ing icen reiza ci	neiza auty i butne f past f past for, is reate be pr for is	kion in are nils; e r than esent not	83-	Cha exte pres and reac cfsh	noise noing enting 40 to 8 h char pled	ition r emta struc both iDSS (ineiz	vay b akins bres bank of stre ed an	e anis Si Xarr d	Baa gaa bo cra dis hat ren	nics s ich i S of smei smei spis idas nove	shore the s ized : crest d ent	d with mest tream and stream (y ai) (refy.	h Towe In cea 2m Sted	r ch or
SCORE	19 18	17	16) 15	14	13	12	11	10	9	8	7	ŝ	5	4	3	2	t	Đ
	Ŷ		7 bin	dar	2											Co	ntin	ued	ovi

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AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 11 Site No. 44. Date 201411

USEPA Habitat Assessment ter

LOW GRADIENT STREAMS

Page 2 of 2

Unicie a score fo	xr each paramete
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Habitat	Condition calegory											
parameter	Exceltent			Good			Fair			Poor		
7. Channel sinuosity	The bends in the stream increase the stream i length 3 to 4 times longer than if it was in a streight the , (Male – channe traiding is considered normal in cessial pairs and other low-lying areas. This parameter is not easily rated in these areas.		The bends in the stream increase the stream lengh 2 to 3 times longer than if it was in a straight line			The bends in the stream increase the stream 1 to 2 times orger than if it was in a straight line.			Channel straight: waterway has been channelsed for a long distance.			
SCORE	20 19 18	<u>ا</u> ا	16	15 14	1 13	12 11	13 9	8	76	5 4	3 2	1 0
8. Bank stability (score each Bank)	Banks stable endence of erosion or bank reture absent or minimal ittle potential for future problems <555 of bank affected.		Moderately stable; Infrequent, small excess of erosion mostly heatest over, 5-30% of bank in reach has aross of erosion.			Voterstay unstable; 30- 60% of basis in reach has areas of erosion, high erosion potential during floods.			Unstable, many eroded areas, 'raw' areas frequent song straight sections and bends; obvious bank stoughing; 60-900% of bank has erosional scars.			
SCORE	Left bank	10	9	10	1	6	5	4	1	. 1	1	0-
SCORE	Righ; bank	10	9	D	7	6	5	4	3	2	1	0
9. Vegetative protection (source each bank)	Were than 90% of the streambark surfaces and insmediate riperian zone covered by naive vegetator, inducing lineas, understoray sinubs, or non-woody macrophytes; vegetative discuption through gracing or moving naining or not evident, almost all plants ecoved to grow naturally.		70-905 of the sciences's surfaces covered by native vegetation, but one class of plants is not wret- represented, tissruption evident but not affecting but plant growth potential to any great extant, more than one half of the potential plant, studde height remaining.			50-70% of the streambark suffices covered by vegetation deroption dovidus; pathes of bare sol or dosely empode vegetation common less than coe-lugit of the polential plant subble height remaining			Less than 50% of the streambark surfaces covered by vegetation disruption of streambark vegetation is very high vegetation has been removed to 5 continenes or less in average stubble height			
SCORE	Left bank	10	9		7	6	5	4	3	2	1	٥
SCORE	Righl benk	10	9	R	7	6	5	4	3	2	1	0
10. Riparian zone score (score each bank)	VA(th of ripatian zone >18 metres; human activities (i.e. roads, lawrs, crops etc.) have not impacted the ripatian zone			Wash of nparian zone 12-18 menes; human activities have isspaced the sparian zone only stinimaty.			With of riparan zone 6- 12 metres; human activities have impacted the riparian zone a great deal.			Victo d'irpanan zone - Simetres, litteor po riscein vegetation is present because d' human activities.		
SCORE	Left bank	10	9	. 8	7	6	5	4	3	2	$\overline{\bigcirc}$; O
SCORE	Föghl bank	10	3	5	7	6	5	4	3	2	$\overline{\mathbb{O}}$	0

TOTAL LOW GRADIENT HABITAT SCORE



Date

Site No. UA

Channel cross-sections and variables to be measured in the area around a cross section

Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at homogeneous sampling sites (generally biviand streams) and three cross-sections at heterogeneous sampling sites (generally upland streams). Where the water level at the time of sampling is at or near the water mark level, stream wight at the water surface will be equal to stream wight at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

	Cross-section sketch		Cross	s-section number of
			Type of Riffle	bedform at the cross-section
Bank height (m)	The charmel skietch should show in cross the water surface, watermark and bandful putcrops and snags encountered at the co	section the shape of the channel and include the location of (points, Also show other Seatures such as bers, tooky uss section	Stream Stream	Bankfull channel width (m) (=total of boxes A+B+C) m width at the water mark (m) 35_{A} Bank height (m) 2.5 width at the water surface (m)
Bank width (m) Vertical distance between the water surface and the water mark (m)	Horizontal dis	tances (m)		Bank width (m) Vertical distance between the water surface and the water mark (m)
Riparian zone width Left bank <u>1.5</u> (m) R	tight bank <u>(+5</u> (m)	Notes on cross-section measure	ment	
Bank material Assess	% composition for each bank Left bank Right bank	Substrate composition Assess % composition in the area of bed 5m either the cross-section.	r side of	Assess in the area 5m either side of Filamentous algae cover the cross section 10-35% 35-65% 65-90% >90%
Bedrock Boulder (>256mm)		Bedrock (%) Boulder (>256mm) (%)	\sum	Periphyton cover
Cobble (64-256mm) Pebble (16-64mm)		Cobble (64-256mm) (1) Pebble (16-64mm) (1)		✓<10% 10–35% 35-65% 65-90% >90% Moss cover
Gravel (2-16mm) Sand (0.06-2mm)	<u>5</u> 5	Gravel (2-16mm)		<pre>\ <10% □10-35% □35-65% □65-90% □>90%</pre>
mittes (soc and clay, <0.06mm	リーンフィーレー イー・イー Total 100% each	Fines (sill and clay <0.06mm)	ر <i>ر</i> يز	Detritus cover

AUSRIVAS Physical and	Chemical Assessment Protocol Field Data Sheets Page 13	
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Date

Site No.

Channel cross-sections and variables to be measured in the area around a cross section

Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at homogeneous sampling sites (generally lowland streams) and three cross-sections at heterogeneous sampling sites (generally upland streams). Where the water level at the time of sampling is at or near the water mark level, stream with at the water surface will be equal to stream with at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

	Cross-section sketch		Cros	s-section number	of
			Type of	bedform at the cross-section	ner
Bank height (m)	The charred sketch should show in cross the water surface, wetermark and bendo outcops and snags encountered at the c	section the shape of the channel and include the location inports. Also show other features such as bars, rocky oss section.	ाल Stream	Bankfull channel width (m) (=total of boxes A+B+C) m width at the water mark (m) width at the water surface (m)	Bank height (m
Bank width (m) 🕒 🕫		arces (m)			Bank width (m)
Vertical distance between the water surface and the water mark (m)	Vertical water	depihs (cm)			Vertical distance between the water surface and the water mark (m)
Riparian zone width	indut hank (m)	Notes on cross-section meas	urement		
Bank material Assess	% composition for each bank Left bank Right bank	Substrate composition Assess % composition in the area of ced 5m the cross-section.	n ei lher side of	Asses Filamentous algae cover	is in the area 5m either side of the cross section 65-90% >90%
Bedrock Boulder (>256mm) Cobble (64-256mm)		Bedrock _ Boulder (>256mm) _ Cobble (64-256mm) _) ×	Periphyton cover	65-90% >90%
Pebble (16-64mm) Gravel (2-16mm) Sand (0.05-2mm)		Pebble (16-64mm) Gravel (2-16mm) Sand (0.06-2mm)		Moss cover	65-90% >90%
Fines (sitt and clay, <0.06mm))	Fines (stit and clay <0.06mm)		Detritus cover	65-90% >90%
AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 14					
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Channel cross-sections and variables to be measured in the area around a cross section

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Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at homogeneous sampling sites (generally lowland streams) and three cross-sections at heterogeneous sampling sites (generally upland streams). Where the water level at the time of sampling is at criteria the water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

Cro	oss-section sketch		Cros	s-section number	of
			Type of	bedform at the cross-section	r
Bank height (m)	har net sketch should show in cross- ater surface, watern ark and banifus gas and snags encountered at the cr	section the shape of the channel and include the location of points. Also show other features such as bars, moky assisted on.	Strea Stream	Bankfull channel width (m) (=total of boxes A+B+C) am width at the water mark (m) width at the water surface (m)	Bank height (m)
Bank width (m)	Horizontal dist	ar.ces (m)	ement		Vertical distance between the water surface and the water mark (m)
Left bank (m) Right	bank (m)			·	
Bank material Assess % con Bedrock Boulder (>256mm) Cobble (84-258mm) Pebble (16-64mm) Gravel (2-16mm)	mposition for each bank Left bank Right bank	Substrate composition Assess ½ composition in the area of bed Em eit the cross-section. Bedrock Boulder (>256mm) Cobble (64-256mm) Pebble (16-64mm) Gravel (2-16mm)		Assess Filamentous algae cover \$\begin{aligned} <10\% 10-35\% 35-65\% [Periphyton cover \$\begin{aligned} <10\% 10-35\% 35-65\% [Moss cover \end{aligned}	in the area 5m either side of the cross section 65-90% >90%
Sand (0.06-2mm) F ines (silt and clay, <0.06mm)	ـــــــــــــــــــــــــــــــــــــ	Sand (0.06-2mm)			65-90%>90% 65-90%>90%

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| AUSRIVAS Physical Assessment Protocol Field Data Sheets                                                                                                                                        | Page 1                  | Site No. <u>6</u> A Date                                                                               | 20:9117                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|--------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| Date <u>20 9 M</u> Site No. <u>64 (124</u> Time<br>River Name VOLKY (1821                                                                                                                      | 3-30pm                  | Recorder's Name                                                                                        | + U2                                                                 |
| Weather $f_{nel} + f_{NVN}$ Rain in last week? Y [] N [X]         Weather $f_{nel} + f_{NVN}$ Rain in last week? Y [] N [X]         Latitude: $f_{nel} + f_{NVN}$ Longitude:                   | Photograph numb         | ers and details Leesa's                                                                                | phine                                                                |
| GPS Name and Datum                                                                                                                                                                             |                         | ······                                                                                                 |                                                                      |
| PLANFORM SKETCH OF SITE Including beform types, location of cross-sections, access points, landmarks and natural or artificial channel of Left bank is facing downstream.<br>VERV to $WOTOS$ . | e ficoolplain leatures. | LENGTH OF SAMPLING S<br>Bankfull width<br>Length of sampling site                                      | SITE<br>(m)<br>x 10<br><u>∦ 𝔅𝔅̣̣̣̣̣̣̣̣̣̣̣̣̣̣̣̣̣̣̣̣̣̣̣̣̣̣̣̣̣̣̣̣̣̣</u> |
|                                                                                                                                                                                                |                         | Notes                                                                                                  | <u> </u>                                                             |
|                                                                                                                                                                                                |                         |                                                                                                        |                                                                      |
|                                                                                                                                                                                                |                         |                                                                                                        |                                                                      |
| Faulma                                                                                                                                                                                         |                         |                                                                                                        |                                                                      |
| red back faily with.                                                                                                                                                                           |                         |                                                                                                        |                                                                      |
| Willy wag tail                                                                                                                                                                                 |                         |                                                                                                        |                                                                      |
| Fed-reck walkiby.<br>Pièd cormonant                                                                                                                                                            |                         | BEFORE LEAVING THE<br>SITE, CHECK DATA<br>SHEETS TO ENSURE<br>THAT ALL VARIABLES<br>HAVE BEEN RECORDED | , <b>Y</b>                                                           |

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Acknowledgments - The content and fayout of these data sheets are derived from the sheets used in the River Habitat Audit Procedure (Anderson, 1993a), AUSRIVAS, the Index of Stream Condition (Ladson and White, 1999 and DNRE Victoria) and the River Habitat Survey (Raven et al., 1998).

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| BASIC WATER CHEMISTRY                                                                 |                    | Valley shape                                                                         | Local impacts on streams                                      |  |  |  |  |  |
|---------------------------------------------------------------------------------------|--------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------|--|--|--|--|--|
| See surface worker                                                                    | Units              | Choose one category only                                                             | Choose one or more categories and describe the detail of each |  |  |  |  |  |
| Temperature                                                                           | °C                 | Steep valley                                                                         | Sand or gravel mining Sewage effluent                         |  |  |  |  |  |
| Conductivity                                                                          |                    |                                                                                      | . Other mining Channel straightening                          |  |  |  |  |  |
| Dissolved Oxygen                                                                      | mg l⁻¹             | Shallow valley                                                                       | . Road - bed HVU CHEST River improvement works                |  |  |  |  |  |
| Dissolved Oxygen Sat.                                                                 | %                  |                                                                                      | Bridge / culvert / wharf Water extraction                     |  |  |  |  |  |
| рН                                                                                    |                    | Broad valley                                                                         | Ford / ramp                                                   |  |  |  |  |  |
| Turbidity                                                                             |                    |                                                                                      | Discharge pipe Grazing                                        |  |  |  |  |  |
| Total phosphorus                                                                      |                    | Gorge                                                                                | Forestry activities                                           |  |  |  |  |  |
| Total nitrogen                                                                        |                    |                                                                                      | Sugar mill                                                    |  |  |  |  |  |
| ALKALINITY                                                                            |                    | Symmetrical                                                                          | Inigation run-off or Other                                    |  |  |  |  |  |
| Amount of water                                                                       | ml                 |                                                                                      | Description                                                   |  |  |  |  |  |
| Amount of H <sub>2</sub> SO <sub>4</sub>                                              | ml                 | Asymmetrical                                                                         |                                                               |  |  |  |  |  |
| Alkalinity                                                                            | mg l <sup>-1</sup> |                                                                                      |                                                               |  |  |  |  |  |
|                                                                                       |                    | ļ                                                                                    | Local landuse<br>Chasse and astronom for each hark            |  |  |  |  |  |
| Floodplain width                                                                      |                    | Average(m)                                                                           | Left Right                                                    |  |  |  |  |  |
| Electricia features                                                                   |                    |                                                                                      | Native forest                                                 |  |  |  |  |  |
| Choose one or more features when present                                              |                    |                                                                                      | Native grassland (not grazed)                                 |  |  |  |  |  |
| Sampling site has no distinct floodplain                                              | Scr                | roll systems                                                                         | Grazing (native or non-native pasture)                        |  |  |  |  |  |
| Oxbows / billabongs                                                                   | Sho<br>alor        | ort, crescentic strips or patches formed<br>no the inner bank of a stream meander    | Exotic grassland (lawns etc., no grazing)                     |  |  |  |  |  |
| Body of water occupying a former river<br>meander, isolated by a shift in the stream  | Spl                | lays                                                                                 | Forestry Native [ ] [ ] Pine [ ] [ ]                          |  |  |  |  |  |
| channel                                                                               | Sm Sm              | all alluvial fan formed where an                                                     | Cropped Rainfed [ ] [ ] Irrigated [ ] [ ]                     |  |  |  |  |  |
| Eormed during a previous bydrological                                                 | and                | deposits material on the floodplain                                                  | Urban residential                                             |  |  |  |  |  |
| regime. May be infilled with sediment                                                 | Flo                | odplain scours                                                                       |                                                               |  |  |  |  |  |
| Flood channels                                                                        | Clei               | our holes formed by the concentrated<br>aring and digging action of flowing water    | Industrial or intensive agricultural                          |  |  |  |  |  |
| A channel that distributes water onto the<br>floodplain and off the floodplain during |                    | floodplain features oresent                                                          |                                                               |  |  |  |  |  |
| floods                                                                                | Flo<br>doe         | odolain present at the sampling site but<br>as not contain any of the above features | Other                                                         |  |  |  |  |  |

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#### Overall vegetation disturbance rating

Choose one category only. Sites with valley vegetation cleared on BOTH sides, but with riparian vegetation in good condition should be scored in the high disturbance category. Words within the drawings summarise the detailed text about the state of the riparian and valley vegetation for each category.



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|          |               |                  |                     | ∼          |                 |
|----------|---------------|------------------|---------------------|------------|-----------------|
| U shaped | Flat U shaped | Deepened U shape | Widened or infilled | Two stage  | Multi stage     |
|          |               |                  |                     |            |                 |
| <br>Box  | Wide box      | ✓ V shaped       | Trapezoid           | Concrete V | Pipe or culvert |

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| Factors affecting  | bank stability |  |
|--------------------|----------------|--|
| Choose one or more | categories     |  |
| None               | Cleared        |  |
| Mining             | vegetation     |  |
| Runoff             | draw-down      |  |
| Stock              | Reservoir      |  |
| Human              | Seepage        |  |
| Ford, culvert      | Flow and waves |  |
| Feral animals      | Drainpipes     |  |
| Other              |                |  |
| Description        |                |  |
| <u> </u>           |                |  |
|                    |                |  |

| Left Right bank bank bank bank bank bank bank bank                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                               | Bank slope                                                                                                  | e .                                   | ~                                  |                                                                       |                                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|---------------------------------------|------------------------------------|-----------------------------------------------------------------------|-----------------------------------------------------------------|
| Vertical       80 - 90°         Steep       5         60 - 83°       1         Moderate       1         30 - 60°       1         Low       1         10 - 30°       1         Flat       1          10 - 30°         Flat       1          10 - 30°         Steep       1         Kight Bank       1         Steep       1         Kight Bank       1         Kight Bank       1         Steep       1 <td></td> <td>Cribose one</td> <td>category</td> <td>tor ea</td> <td>ach Da<br/>Lefi<br/>bank</td> <td>Right</td>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                               | Cribose one                                                                                                 | category                              | tor ea                             | ach Da<br>Lefi<br>bank                                                | Right                                                           |
| Steep       Steep         60 - 83°       Moderate         30 - 60°       Image: Construction of the structure of the                                                               |                                                               | $\square$                                                                                                   | Vertical<br>80 - 90°                  |                                    |                                                                       |                                                                 |
| Moderate         30 - 60°         Low         10 - 30°         Flat         <10°                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                               |                                                                                                             | Steep<br>60 - 83°                     |                                    |                                                                       | X                                                               |
| Low       10 - 30°       Image: Constraint of the structure |                                                               | $\square$                                                                                                   | Moderat<br>30 - 60°                   | te                                 |                                                                       |                                                                 |
| Flat         <10°                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                               |                                                                                                             | Low<br>10 - 30°                       |                                    | X                                                                     |                                                                 |
| Bedrock outcrops         Assess % of each bank covered by bedrock outcrop         % bedrock outcrops       Left bank         % bedrock outcrops       Left bank         Right Bank                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                               |                                                                                                             | Flat<br><10°                          |                                    |                                                                       |                                                                 |
| Artificial bank protection measures         Choose one or more categories         None       Fenced stock watering points         Fence structures       Vegetation plantings         Rock or wall layer       Logs strapped to bank         Rip rap       Concrete channe                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Bedro<br>Assess<br>% bed                                      | ck outcrops<br>% of each ba<br>frock outcrop                                                                | s<br>ank covere<br>os Left I<br>Right | ed by<br>bank<br>Ban               | bedro<br>                                                             | ock outcrops                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Artific<br>Choose<br>DFe<br>DFe<br>DE<br>Re<br>Re<br>Re<br>Re | ial bank pro-<br>e one or more<br>ne<br>nce structur<br>evee banks<br>ock or wall la<br>p rap<br>enced huma | n                                     | mea<br>Fe<br>Ve<br>pla<br>Lo<br>Co | sure:<br>encect<br>aterin<br>egeta<br>antin;<br>gs st<br>bank<br>nore | s<br>I stock<br>Ig points<br>tion<br>gs<br>rapped<br>te channel |
| Other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Ot                                                            | cess<br>her                                                                                                 |                                       |                                    | iet <b>y</b>                                                          |                                                                 |

| Page 5 Site No. 64 624 Date 20[917]                                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sediment oils                                                                                                                                           |
| Water oils                                                                                                                                              |
| Sediment odours                                                                                                                                         |
| Water odours                                                                                                                                            |
| Turbidity (visual assessment)<br>☐ Clear ☐ Slight ☐ Turbid ☐ Opaque<br>↓ ↓ ↓<br>is water clarity reduced by:<br>Suspended material ☐ Dissolved material |
| (e.g mud, clay, organics) (e.g plant leachates)<br>Water level at the time of sampling                                                                  |
| Dry No flow Low Baseflow or near baseflow<br>High Flood (don't sample)                                                                                  |
| Artificial features at the sampling site<br>Choose one or more categories                                                                               |
| Major Minor Ford Bridge Culvert Cother                                                                                                                  |
| Description void, tell kill (1955-9<br>Bed defend; by placed due vork from 1000                                                                         |
| Large woody debris<br>Overall % cover of logs and branches greater than 10cm in diameter                                                                |
| % Notes on visibility                                                                                                                                   |

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Site No. 64 G241 Date 20 9117



# Page 7 Site No. <u>6A C2H</u> Date <u>2019/17</u>

| Bed compaction<br>Chocse one category only                                                                                                      | Sediment matrix<br>Choose one category only                                                              | Sediment angularity<br>Choose one category only                                                                          |
|-------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| Tightly packed, armoured<br>Array of sediment sizes,<br>overlapping, tightly packed and<br>very hard to dislodge                                | Bedrock                                                                                                  | Assess cobble, pebble and gravel fractions only                                                                          |
| Packed, unarmoured<br>Array of sediment sizes,<br>overlapping, tightly packed but<br>can be dis odged with moderate                             | Open framework<br>C-5% fine sediment, high<br>availability of interstitial space                         | Angular                                                                                                                  |
| Moderate compaction<br>Array of sediment sizes, .intle<br>overlapping, some packing but<br>can be dislodged with moderate                       | Matrix filled contact<br>framework<br>5-32% fine sediment, moderat<br>availability of interstitial space | te fro:<br>Wards<br>Wards<br>Bubble<br>Sub-angular<br>Sub-angular<br>Sub-angular<br>Rounded                              |
| Low compaction (1)<br>Limited range of sediment<br>sizes, little overlapping, some<br>packing and structure but can<br>be dislodged very easily | Framework dilated<br>32-60% fine sediment, low<br>availability of interstitial space                     | es Well rounded                                                                                                          |
| Low compaction (2)<br>Loose array of fine sediments,<br>no overlapping, no packing and                                                          | Matrix dominated<br>>60% fine sediment, interstitia<br>spaces virtually absent                           | al gravel fractions not present                                                                                          |
| <ul> <li>structure and can be dislodged</li> <li>very easily</li> </ul>                                                                         |                                                                                                          | In the USEPA Habitat Assessment on the following pages, be sure to use the correct form for high or low gradient stream: |

Bed stability rating Choose one category only

Unstable - eroding 🗲

Unstable - depositing

| Severe erosion                                                                                                                                              | Moderate erosion                                                                                                                                                                                           | Bed stable                                                                                                                                                                                                                                      | Moderate deposition                                                                                                          | Severe deposition                                                                                                                                                                                                                                   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Streambed scoured of fine<br>sediments. Signs of channel<br>deepening. Bare, severely eroded<br>banks. Erosion heads. Steep<br>streambed caused by erosion. | Little fine sediment present. Signs<br>of channel deepening. Eroded<br>banks. Streambed deep and<br>narrow. Steep streambed<br>icomprised of unconsolidated<br>(loosely arranged and unpacked)<br>material | A range of sed ment sizes present in<br>the streambed. Channel is in a<br>'relatively natural' state (not<br>deepened or infilled). Bed and bar<br>sediments are roughly the same<br>size. Banks stable. Streambed<br>comprised of consolidated | Moderate build-up of fine sediments<br>at obstructions and bars.<br>Streambed flat and uniform.<br>Channel wide and shallow. | Extensive build up of fine sediments<br>to form a flat bed. Channel blocked,<br>but wide and shallow. Bars large<br>and covering most of the bed or<br>banks. Streambed comprised of<br>unconsolidated (loosely arranged<br>and unpacked) material. |
|                                                                                                                                                             |                                                                                                                                                                                                            | (tightly arranged and packed) material.                                                                                                                                                                                                         |                                                                                                                              |                                                                                                                                                                                                                                                     |

------- Stable -

## AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 8 Site No. \_\_\_\_\_ Date \_\_\_\_\_

#### USEPA Habitat Assessment Circle a score for each parameter

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### HIGH GRADIENT STREAMS

Page 1 of 2

| N 47 1                                            |                                                                                                                                                                                                                                                                                                           |                                                                                |                                           |                                              |                   |                                                                                                                                                                                                                             |                                                          |                                                                                                                                                             |                                                                                        |                        |                                                                                                                                                                      |                                                                                                                                                                                                                                                         |                                     |                                   |          |                                                                                                                                                                     |                                                                                                                                                                              |                                                 |                         |    |   |
|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|-------------------------------------------|----------------------------------------------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-----------------------------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|-------------------------|----|---|
| Habitat                                           |                                                                                                                                                                                                                                                                                                           |                                                                                |                                           |                                              |                   | Condition calegory                                                                                                                                                                                                          |                                                          |                                                                                                                                                             |                                                                                        |                        |                                                                                                                                                                      |                                                                                                                                                                                                                                                         |                                     |                                   |          |                                                                                                                                                                     |                                                                                                                                                                              |                                                 |                         |    |   |
| harameter                                         |                                                                                                                                                                                                                                                                                                           | E                                                                              | celle                                     | n.                                           |                   | 1                                                                                                                                                                                                                           | _                                                        | Grad                                                                                                                                                        | i                                                                                      |                        |                                                                                                                                                                      |                                                                                                                                                                                                                                                         | Fair                                |                                   |          |                                                                                                                                                                     |                                                                                                                                                                              | Po                                              | n n                     |    |   |
| 1.<br>Epifaunai<br>substrate /<br>available cover | Creater than 70% of<br>substate "avoirable for<br>epitaarial colonisation and<br>tish cover, mix of snags,<br>submarged logs, undercat<br>banks, cobble in other<br>stable/hashat and at stage<br>to abov full colonisation<br>potential (i.e. logs/snags<br>fract are on new fail and<br>and fransiezt). |                                                                                |                                           |                                              |                   |                                                                                                                                                                                                                             | (25) an<br>coloris<br>rrite:                             | io of s<br>el-sui<br>adequ<br>main<br>ions; j<br>al sui<br>f new<br>spare<br>an (main<br>sui<br>sui<br>sui<br>sui<br>sui<br>sui<br>sui<br>sui<br>sui<br>sui | ilable<br>ied for<br>ienanc<br>presen<br>xtrais<br>fail, to<br>i for<br>ey raise<br>ex | ia<br>Ele<br>sin<br>.1 | 20-40% mix of stable<br>habitat healts<br>desirating substrate<br>frequently distances or<br>removed.                                                                |                                                                                                                                                                                                                                                         |                                     |                                   |          |                                                                                                                                                                     |                                                                                                                                                                              | ) <sup>7</sup> 3 st<br>of ha<br>strain<br>ackin | aiole<br>Drax<br>9<br>9 | is |   |
| SCORE                                             | 20                                                                                                                                                                                                                                                                                                        | 19                                                                             | 15                                        | 17                                           | 16                | 15                                                                                                                                                                                                                          | 14                                                       | 13                                                                                                                                                          | 12                                                                                     | 11                     | 10                                                                                                                                                                   | 9                                                                                                                                                                                                                                                       | 8                                   | 7                                 | 6        | 5                                                                                                                                                                   | 4                                                                                                                                                                            | 3                                               | 2                       | 1  | 0 |
| 2.<br>Embeddethess                                | Gravel, cobbe and<br>toucker particles are 0-<br>25% summaries by fine<br>sectment. Layering of<br>exoble provides driversity<br>of other space                                                                                                                                                           |                                                                                |                                           |                                              |                   | Gra<br>boul<br>S0%<br>Seci                                                                                                                                                                                                  | ider på<br>Ker på<br>Starte<br>Iment                     | itole a<br>sticke<br>sunce                                                                                                                                  | and<br>slare 2<br>d by 5                                                               | 15-<br>Ne              | Gravel cobbie and<br>boukier particles are 50-<br>75% summanded by fine<br>sectment.                                                                                 |                                                                                                                                                                                                                                                         |                                     |                                   |          | Grave, coble and<br>boulder particles are<br>more than 75%<br>surrounded by fine<br>sedimers.                                                                       |                                                                                                                                                                              |                                                 |                         |    |   |
| SCORE                                             | 20                                                                                                                                                                                                                                                                                                        | 19                                                                             | 18                                        | 17                                           | 16                | 15                                                                                                                                                                                                                          | 14                                                       | 13                                                                                                                                                          | 12                                                                                     | 11                     | 10                                                                                                                                                                   | 9                                                                                                                                                                                                                                                       | 8                                   | [7                                | 6        | 5                                                                                                                                                                   | 4                                                                                                                                                                            | 3                                               | 2                       | 1  | 0 |
| 3.<br>Velacity / depth<br>regime                  | AljA<br>Jegi<br>dee<br>dee<br>s⊲<br>×08                                                                                                                                                                                                                                                                   | our vei<br>mes pr<br>p. skow<br>p. /ast-<br>1.3nvis<br>izn).                   | ociyic<br>eseni<br>shake<br>shake<br>ocep | ¥epth<br>(sionar-<br>xv, fes<br>w). S<br>⊪is | il-<br>iow        | Crá)<br>pres<br>mice<br>than<br>regi                                                                                                                                                                                        | r Sicti<br>Renti (d<br>sing, s<br>sing, s<br>mes),       | the 4<br>lfast-<br>correl<br>ising f                                                                                                                        | regions<br>sherov<br>lower<br>other                                                    | as<br>≥i v             | City 2 of the 4 hebbat<br>regimes present (1 fas)-<br>shallow or slow-shallow<br>are massing, score low).                                                            |                                                                                                                                                                                                                                                         |                                     |                                   |          | Continued by 1<br>velocity/Stepib regime<br>(usually slow-deep)                                                                                                     |                                                                                                                                                                              |                                                 |                         |    | - |
| SCORE                                             | 20                                                                                                                                                                                                                                                                                                        | 19                                                                             | 15                                        | 17                                           | 16                | 15                                                                                                                                                                                                                          | 14                                                       | 13                                                                                                                                                          | 12                                                                                     | 11                     | 10                                                                                                                                                                   | 9                                                                                                                                                                                                                                                       | B                                   | 7                                 | 6        | 5                                                                                                                                                                   | 4                                                                                                                                                                            | 3                                               | 2                       | 1  | 0 |
| 4.<br>Sediment<br>deposition                      | Litt:<br>star<br>tess<br>affe<br>dep                                                                                                                                                                                                                                                                      | e of no<br>ros or y<br>than S<br>cles by<br>csition,                           | enkang<br>point is<br>is of 1<br>usecin   | jémen<br>iars a<br>he bo<br>hert             | i of<br>nd<br>nom | Son<br>bar<br>from<br>sec<br>bot)<br>dep                                                                                                                                                                                    | re new<br>format<br>i gravi<br>imeni;<br>om at<br>os bon | vincae<br>Son, n<br>e, sian<br>5-305<br>Jected<br>Lian po                                                                                                   | 2352 à<br>nosty<br>xi or f<br>S ol 1<br>S ol 1<br>S ol 1<br>S ol 1<br>S ol 1<br>S ol 1 | ine<br>He              | 9450<br>0599<br>5500<br>5000<br>5500<br>5500<br>5500<br>5000<br>5000<br>5000<br>5000<br>5000<br>5000<br>5000                                                         | Vederate deposition of Feary<br>new gravel, sand or fine<br>sections to rold and<br>new bors; 30-50% of the<br>bottom affacted,<br>constructions,<br>constructions,<br>constructions and bends;<br>constructions and bends;<br>constructions and bends; |                                     |                                   |          |                                                                                                                                                                     | avy deposits of line<br>textal, increased bar<br>eloparent; more than<br>& of the bottom<br>anging frequently,<br>its atmost absert due<br>substantial sectment<br>sosition. |                                                 |                         |    |   |
| SCORE                                             | 210                                                                                                                                                                                                                                                                                                       | 19                                                                             | 15                                        | 17                                           | 16                | 15                                                                                                                                                                                                                          | 14                                                       | 13                                                                                                                                                          | 12                                                                                     | 11                     | 10                                                                                                                                                                   | 9                                                                                                                                                                                                                                                       | 8                                   | 7                                 | 6        | 5                                                                                                                                                                   | 4                                                                                                                                                                            | 3                                               | 2                       | 1  | 0 |
| 5.<br>Channel flow<br>status                      | VVa<br>bolž<br>mirš<br>cha<br>expr                                                                                                                                                                                                                                                                        | ler reac<br>1 los er<br>crisi ar<br>crisi ar<br>crisi ar<br>crisi au<br>cseci. | ites b<br>tanks<br>yourd -<br>tstrai      | ese of<br>a and<br>of<br>a is                |                   | ₩ <b>3</b><br>848<br><25<br>5.£                                                                                                                                                                                             | :<br>Carfills<br>Cable r<br>Si of c<br>Stale             | >75;<br>tann<br>tharsv<br>is exp                                                                                                                            | softh<br>et or<br>el<br>cseci                                                          | e                      | Wa<br>avai<br>and<br>are                                                                                                                                             | ier fils<br>šabie o<br>kor riff<br>mostly                                                                                                                                                                                                               | i 25-7<br>Charr<br>le suit<br>respi | 15% of<br>10,<br>ostrale<br>osed. | the<br>s | Very lible water in<br>channel and mostly<br>present as standing<br>pools.                                                                                          |                                                                                                                                                                              |                                                 |                         |    |   |
| SCORE                                             | 20                                                                                                                                                                                                                                                                                                        | 19                                                                             | 18                                        | 17                                           | 16                | 15                                                                                                                                                                                                                          | . 14                                                     | 13                                                                                                                                                          | 12                                                                                     | 11                     | 10                                                                                                                                                                   | 9                                                                                                                                                                                                                                                       | 8                                   | 7                                 | £        | 5                                                                                                                                                                   | 4                                                                                                                                                                            | 3                                               | 2                       | 1  | 0 |
| 6.<br>Channe!<br>alteration                       | Che<br>drex<br>miri<br>norr                                                                                                                                                                                                                                                                               | nnetsu<br>Xging a<br>mai, st<br>nai pat                                        | ban D<br>Ksen;<br>(sarn<br>lent           | c<br>or<br>eth                               |                   | Some chemelization<br>present, usuažly in areas<br>of tridge abutments;<br>exidence of past<br>charmétization, i.e.<br>dredging (greater than<br>20 yf) may be present,<br>but recent<br>charmétization, is not<br>present. |                                                          |                                                                                                                                                             |                                                                                        |                        | Channelization may be<br>extensive; emberkments<br>in shoring structures<br>present on both banks;<br>and 40 to 80% of stream<br>reach channesized and<br>disrupted. |                                                                                                                                                                                                                                                         |                                     |                                   |          | Barks shored with<br>gabion or ceneral; over<br>SUN of the stream reach<br>chammelized and<br>discupted. Instream<br>habital greatly altered or<br>hemoved entraty. |                                                                                                                                                                              |                                                 |                         |    |   |
| SCORE                                             | 20                                                                                                                                                                                                                                                                                                        | 19                                                                             | 18                                        | 17                                           | 15                | 15                                                                                                                                                                                                                          | 14                                                       | 13                                                                                                                                                          | 12                                                                                     | 11                     | 10                                                                                                                                                                   | 9                                                                                                                                                                                                                                                       | 8                                   | 7                                 | 6        | 5                                                                                                                                                                   | 4                                                                                                                                                                            | 3                                               | 2                       | 1  | 0 |

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#### AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 9 Site No. \_\_\_\_\_\_ Date \_\_\_\_\_

USEPA Habitat Assessment Circle a score for each parameter

#### HIGH GRADIENT STREAMS

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| Habitat                                             |                                                                                                                                                                                                                                               |                                                                                                                          | Condition category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                       |                                                                                                                      |                                                                    |                                                                                                                                                                                                                                        |   |                                                                                                                                                               |                                                                                                                                                                |      |                                                                                                                                                                                          |   |      |   |                                                            |                                                                  |  |  |  |
|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|------|---|------------------------------------------------------------|------------------------------------------------------------------|--|--|--|
| parameter                                           | Exce                                                                                                                                                                                                                                          | Elent                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                       |                                                                                                                      | Good                                                               |                                                                                                                                                                                                                                        |   |                                                                                                                                                               | _                                                                                                                                                              | Fzir |                                                                                                                                                                                          |   | Poor |   |                                                            |                                                                  |  |  |  |
| 7.<br>Frequency of<br>riffles (or bends)            | Occurrence of<br>relatively freq<br>of distance be<br>affles dy/ded<br>the stream <<br>[generally 5 b<br>of habitat is k<br>streams whe<br>continuous.]<br>of balicers of<br>large, natural<br>is important.                                  | f riffes<br>werkt ri<br>tween<br>by wid<br>to<br>7): we<br>ey. In<br>re riffes<br>kaces<br>obstruction                   | suo<br>ita of<br>niety<br>sare<br>st<br>ction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Octu<br>intro<br>between<br>by the<br>streat<br>15.                                                                                                   | IT ÉP<br>RUEIÓ<br>Xen I.<br>R IIS<br>IT IS                                                                           | veol nii<br>1: distan<br>nifites dr<br>ath of thy<br>t-t-twee<br>/ | Nes<br>ce<br>nicked<br>e<br>n73⊃                                                                                                                                                                                                       |   | Cocasional noe or bent<br>botiom contours provide<br>some habitat, distance<br>between rifles divided<br>by the width of the<br>steam is between 15 to<br>25. |                                                                                                                                                                |      |                                                                                                                                                                                          |   |      |   | i flai v<br>es; po<br>ance<br>les ch<br>a of th<br>ratio ( | lal water or<br>poor<br>ice<br>s chuided<br>f the<br>fise of >25 |  |  |  |
| SCORE                                               | 20 19 1                                                                                                                                                                                                                                       | 8 17                                                                                                                     | 16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 15                                                                                                                                                    | 14                                                                                                                   | 13                                                                 | 12 1                                                                                                                                                                                                                                   | 1 | 10 5                                                                                                                                                          | Ĩ                                                                                                                                                              | 8    | ۲                                                                                                                                                                                        | 6 | 5 4  | 3 | 2                                                          | 1 🛛                                                              |  |  |  |
| 8.<br>Bank stability<br>(score each bank)           | Banks stable<br>of erosion or<br>absent or mi<br>potencial for f<br>problems, ca<br>affected                                                                                                                                                  | , exider<br>bark fa<br>imal, i<br>ture<br>i% of b                                                                        | rce<br>ikure<br>iSe<br>ar⊀                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Mode<br>Infreq<br>of er:<br>over,<br>reach<br>erost                                                                                                   | Moderately unstable, 33-<br>50% of bank in reach<br>Juss areas of encion;<br>high encion potential<br>during floods. |                                                                    |                                                                                                                                                                                                                                        |   |                                                                                                                                                               | Unstaine; many exceed<br>areas; haw areas<br>frequent along straight<br>sections and benos;<br>novious bank shoughing<br>50-1005; of bank has<br>benoend areas |      |                                                                                                                                                                                          |   |      |   |                                                            |                                                                  |  |  |  |
| SCORE                                               | Leil bank                                                                                                                                                                                                                                     | 10                                                                                                                       | 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 8                                                                                                                                                     | Ì                                                                                                                    | 7                                                                  | 6                                                                                                                                                                                                                                      |   | 5                                                                                                                                                             |                                                                                                                                                                | 4    |                                                                                                                                                                                          | 3 | 2    |   | 1                                                          | 0                                                                |  |  |  |
| SCORE                                               | Right bark                                                                                                                                                                                                                                    | 10                                                                                                                       | 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | \$                                                                                                                                                    | İ                                                                                                                    | 7                                                                  | 6                                                                                                                                                                                                                                      | - | 5                                                                                                                                                             | İ                                                                                                                                                              | 4    | Τ                                                                                                                                                                                        | 3 | 2    |   | 1                                                          | -0                                                               |  |  |  |
| 9.<br>Vegetative<br>protection<br>(score each back) | More than 50<br>streambank :<br>and rm exists<br>2014: covers, unders<br>streats, unders<br>streats, unders<br>streats, unders<br>streats, unders<br>disciplication the<br>grazing or im<br>minimal or ino<br>atmost all pla<br>to grow heats | 70-90<br>stread<br>could<br>vegat<br>of ple<br>repre<br>evide<br>full pl<br>kolary<br>more<br>the pl<br>stubic<br>remain | Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Carbon<br>Si Car | of the<br>ana surfa<br>by restwa<br>n, but on<br>is not wi<br>ted, Gara<br>will not at<br>growth p<br>eat exter<br>n one ha<br>tist pant<br>tist pant | ices<br>ine dass<br>al-<br>uption<br>facting<br>totra bia<br>f<br>t;<br>f<br>of                                      |                                                                    | 50-70% of the<br>streambark surfaces<br>covered by vegetation;<br>discussion obvious;<br>patients of bare soil or<br>classly norphat<br>wegetation common; less<br>than one-haif of the<br>potential plant studdle<br>height remaining |   |                                                                                                                                                               |                                                                                                                                                                |      | Less car outs of the<br>streamber k surfaces<br>operad by vegetation<br>disruption of strambark<br>vegetation tas been<br>removed to 5<br>cestimetes offers a<br>average stubble height. |   |      |   |                                                            |                                                                  |  |  |  |
| SCORE                                               | Left bank                                                                                                                                                                                                                                     | 10                                                                                                                       | 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 8                                                                                                                                                     | 1                                                                                                                    | 7                                                                  | 6                                                                                                                                                                                                                                      |   | 5                                                                                                                                                             | Τ                                                                                                                                                              | 4    |                                                                                                                                                                                          | 3 | 2    | 1 | 1                                                          | Ū                                                                |  |  |  |
| SCORE                                               | Right bank                                                                                                                                                                                                                                    | 10                                                                                                                       | 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | B                                                                                                                                                     | ļ                                                                                                                    | 7                                                                  | 6                                                                                                                                                                                                                                      |   | 5                                                                                                                                                             |                                                                                                                                                                | 4    |                                                                                                                                                                                          | з | 2    |   | 1                                                          | û                                                                |  |  |  |
| 10.<br>Riparian zone<br>score<br>(score each bank)  | Width of rips<br>>19 metres;<br>activities (i.e.<br>lawns, crops<br>not impacted<br>zone.                                                                                                                                                     | WSch<br>12-12<br>activi<br>Use ni<br>miršn                                                                               | h of<br>5 me<br>bies<br>pani<br>naty                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | riparian<br>etres; hu<br>have im<br>an sone-<br>(,                                                                                                    | zone<br>man<br>pacteo<br>only                                                                                        |                                                                    | With of inpatian zone 6-<br>12 metres; Yuman<br>activities have impacted<br>the ripatian zone a great<br>deal.<br>With of inpatian z<br>S matres; Rue or<br>present because in<br>human activities.                                    |   |                                                                                                                                                               |                                                                                                                                                                |      | zone<br>cino<br>alis<br>of                                                                                                                                                               |   |      |   |                                                            |                                                                  |  |  |  |
| SCORE                                               | Left bank                                                                                                                                                                                                                                     | 10                                                                                                                       | 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 8                                                                                                                                                     | Τ                                                                                                                    | 7                                                                  | 6                                                                                                                                                                                                                                      |   | 5                                                                                                                                                             | ļ                                                                                                                                                              | 4    | ļ                                                                                                                                                                                        | 3 | 2    |   | 1                                                          | 0                                                                |  |  |  |
| SCORE                                               | Right, bank                                                                                                                                                                                                                                   | · 10                                                                                                                     | <b> </b> \$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 18                                                                                                                                                    | T                                                                                                                    | ĩ                                                                  | 6                                                                                                                                                                                                                                      | _ | 5                                                                                                                                                             | ŝ                                                                                                                                                              | 4    | Į.                                                                                                                                                                                       | 3 | : 2  |   | 1                                                          | 0                                                                |  |  |  |

TOTAL HIGH GRADIENT HABITAT SCORE



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| parameter         Excellent         Good         Fair         Poor           1.         Creater than 50% of<br>splarnal constraint<br>available cover         32.90% mixed stable<br>that constraint<br>available cover         Less than 10% of<br>splarnal constraint<br>and its sage to save that<br>constraint stable stable about a<br>stable stable about at<br>an at sage to save that<br>constraint potential<br>(its keysbrage) the same<br>to new tail and not<br>common.         23.90% mixed stable<br>babbait yessiont<br>of potential about a<br>potential cover<br>and at sage to save that<br>correction potential<br>(its keysbrage) the same<br>to new tail and not<br>common.         Less than 10% of<br>potential cover<br>and at sage to save that<br>correction prevents to<br>and at sage to save that<br>down and not<br>common.         Second<br>potential cover<br>and at sage to save<br>that and not<br>common.         Less than 10% of<br>potential cover<br>and at sage to save<br>that and not<br>common.         Less than 10% of<br>potential cover<br>and at sage to save<br>that and not<br>common.         Less than 10% of<br>potential cover<br>and at sage to save<br>that and not<br>common.         Less than 10% of<br>potential cover<br>and at sage to save<br>that and not<br>common.         Less than 10% of<br>potential cover<br>and save subbraged<br>vegetation prevent<br>mater as submerged<br>vegetation prevent<br>that save to submerged<br>vegetation prevent<br>common.         Less than 10% of<br>potential cover<br>mater as and<br>some new tors 50% of the<br>bottom stream that<br>deprosist on<br>more preventant free<br>section related by<br>save about any<br>status         Less than 20% of the<br>some new tors 50% of the<br>some new tors 50% of the<br>bottom stream that<br>deprosist on<br>more preventant free<br>deprosist on<br>more preve | Habitat                                           | ľ                                                                                                                                                                                                                                                                                            |                                                                 |                                                                                                                                                                                                                                        |                                                                                                                                                                                                        |                                                                                                                                                                                                                                        |                                                         | (                                                                                                                                                                   | Cond                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ition    | cale                                                | a ó r                                                                                                                                                            | 7                                  |                               |           |                          |                             | _                       |                        |              | -  |
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| 1.       Creater than 50% of substrate for public of public on substrate for substrate for auxable for explorating downsizing and fight cover and fight cover and fight cover substrate for any substrate for any substrate for any substrate for any substrate for any substrate for the stable basis. Cobbin of public on substrate for any substrate for the stable basis of the substrate for the stable basis of the substrate for any substrate for the stable basis of the substrate for stable basis of the substrate for the stable basis of the substrate for the stable basis of the substrate for stable basis of the substrate for stable basis of the substrate for stable basis of the substrate for stable basis of the substrate for stable basis of the substrate for stable basis of the substrate for stable basis of the substrate for stable basis of the substrate for stable basis of the substrate for stable basis of the substrate for stable basis of the substrate for stable basis of the substrate for stable basis of the substrate for stable basis of the substrate for stable basis of the substrate for stable basis of the substrate for stable basis of the substrate for stable basis of the substrate for stable basis of the substrate for stable basis of the substrate for stable basis of the 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                                                                                                                                              | Excell                                                          | ent                                                                                                                                                                                                                                    |                                                                                                                                                                                                        |                                                                                                                                                                                                                                        |                                                         | Gool                                                                                                                                                                | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |                                                     | -                                                                                                                                                                | Fair                               |                               |           |                          |                             | Þo                      | or                     |              |    |
| SCORE       20       18       17       16       15       14       13       12       11       10       9       8       7       6       5       4       3         Pool substrate<br>characterization       Midure of suistrate<br>matrias, with greed<br>and firm cand prevelent,<br>room matrias and<br>submerged vegatation<br>common.       Midure of sand,<br>mud or clay, rost matring, mud may<br>be dominant; some root<br>matring submerged<br>vegatation, resert.       All moder diagras submerged<br>wegatation, resert.       Hard-pan clay root<br>root root sand<br>becord, no root<br>matring submerged<br>vegatation, resert.       Hard-pan clay root<br>root root sand<br>becord, no root<br>matring submerged<br>vegatation, resert.       Hard-pan clay root<br>root root sand<br>becord, no root<br>matring submerged<br>vegatation, resert.       Hard-pan clay root<br>root root sand<br>vegatation, resert.         SCORE       20       19       18       17       16       15       14       12       11       10       9       8       7       6       5       4       3       2         Secone       20       19       18       17       16       15       14       13       12       11       10       9       8       7       6       5       4       3       2         Secone       20       19       18       17       16       15       14       13       12       1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1.<br>Epifaunal<br>substrate /<br>available cover | Greater than 50% of<br>substrate famurable for<br>epidamal colonization<br>and fish cover, mix of<br>shaga, submerged logs,<br>underout barks, cabble<br>or other stable habitat<br>and at stage to about tai<br>colonisation potential<br>(i.e. logs/strags that are<br>not new fat and not |                                                                 | 30-50% mox of stable<br>habitat welk-sured for<br>fuil opinisation<br>potential; adequate<br>labitat for maintenance<br>of populational substitute in<br>the form of newfail, our<br>not yes prepared for<br>colonisation (may rate at |                                                                                                                                                                                                        | 10-3055 mot of stable<br>habitat, tableat<br>exellability less than<br>desirable substrate<br>(requerity disturbed of<br>removed.                                                                                                      |                                                         |                                                                                                                                                                     | Less than 10% stable<br>habitat, lack of habitat is<br>obvious; substrate<br>unstable or lacking.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |                                                     |                                                                                                                                                                  |                                    |                               |           |                          |                             |                         |                        |              |    |
| 20       10       10       10       10       11       10       9       8       7       6       5       4       3       22         2.       Mixture of substrate<br>characterization       Mixture of substrate<br>and lim sand prevelent<br>roor mets and<br>softmerged vegetation<br>common.       Mixture of soft sand,<br>mud or clay, mud may<br>be dominant some root<br>mats and submerged<br>vegetation present.       Mixture of soft sand,<br>mud or clay, mud may<br>be dominant some root<br>mats and submerged<br>vegetation<br>present.       Hixture of soft sand,<br>mud or clay, or send<br>betroef, root or<br>vegetation<br>present.       Hixture of soft sand,<br>mud or clay, or send<br>betroef, root or<br>vegetation<br>present.       Hixture of soft sand,<br>mud or clay, or send<br>betroef, root or<br>vegetation<br>present.       Hixture of soft sand,<br>mud or clay or send<br>betroef, root or<br>vegetation<br>present.       Hixture of soft sand,<br>mud or clay or send<br>betroef, root or<br>vegetation<br>present.       Hixture of soft sand,<br>mud or clay or send<br>betroef, root or<br>vegetation<br>present.       Hixture of soft sand,<br>mud or clay or send<br>betroef root or<br>respectation<br>root present.       Hixture of soft sand,<br>mod or clay or send<br>betroef root or<br>respectation<br>root present.       Hixture of soft sand,<br>mod or clay or send<br>root mets and<br>status       Hixture of soft sand,<br>mod or clay or send<br>root mets and<br>status       Hixture of soft sand,<br>mod or clay or send<br>root mets and<br>status       Hixture of soft sand,<br>mod or clay or send<br>root mets and<br>status       Hixture of soft sand,<br>mod or clay or send<br>root mets and<br>status       Hixture of soft sand,<br>mod or clay or send<br>root mets and<br>status       Hixture of soft sand,<br>mod or clay or<br>send soft<br>root mets and<br>status       Hix                                                                                                                                                                                                               | SCORE                                             | transia                                                                                                                                                                                                                                                                                      | <u>ni.</u>                                                      |                                                                                                                                                                                                                                        | 40                                                                                                                                                                                                     |                                                                                                                                                                                                                                        |                                                         | 1                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |          |                                                     | _                                                                                                                                                                |                                    | -                             |           |                          |                             | -                       | κ<br>Έ                 | _            | r  |
| 2.       Modure of substrate<br>rearises, with graved<br>and firm sand provelent,<br>roor miss and<br>submerged vegetation<br>common.       Modure of soft sand,<br>mud or day or send<br>bet ownant, some not<br>submerged vegetation<br>respect.       Modure of soft sand,<br>mud or day or send<br>bet ownant, some not<br>respect.       Hard-pan Cay or<br>vegetation, not<br>vegetation, presert.         SCORE       20       19       18       17       16       15       14       12       11       10       9       8       7       6       5       4       3         SCORE       20       19       18       17       16       15       14       13       12       11       10       9       8       7       6       5       4       3       2         SCORE       20       19       18       17       16       15       14       13       12       11       10       9       8       7       6       5       4       3       2         4.       Science to and<br>status       Liste or calorgenetic<br>and less than 20% of the<br>soft and toft and<br>states to an soft bends,<br>and less than 20% of t                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                   | 20 1                                                                                                                                                                                                                                                                                         | 9   18                                                          | 17                                                                                                                                                                                                                                     | 15                                                                                                                                                                                                     | 15                                                                                                                                                                                                                                     | 14                                                      | $\mathbb{C}$                                                                                                                                                        | 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 11       | 10                                                  | 9                                                                                                                                                                | 8                                  | 7                             | 5         | 5                        | 4                           | 13                      | 1                      | 1            |    |
| SCORE     20     19     18     17     16     15     14     13     12     11     10     9     8     7     6     5     4     3     2       3.     Sven mix of large-<br>shalow, large-deep,<br>shalow, large-deep,<br>shalow, large-deep,<br>shalow, singe-deep, usay few shalow, pools large-<br>shalow, angle-<br>deep pools     Majority of pools large-<br>deep pools     Shalow pois much<br>more prevalant than<br>deep pools     Majority of pools<br>more prevalant than<br>deep pools     Majority of pools<br>more prevalant than<br>deep pools     Shalow pois much<br>more prevalant than<br>deep pools     Majority of pools<br>more prevalant than<br>deep pools     Shalow pois much<br>more prevalant than<br>deep pools     Majority of pools<br>more prevalant than<br>deep pools     Shalow pois much<br>more prevalant than<br>deep pools     Majority of pools<br>more prevalant than<br>deep pools       4.     11     16     17     16     15     14     13     12     11     10     9     8     7     6     5     4     3     2       4.     11     16     17     16     15     14     13     12     11     10     9     8     7     6     5     4     3     2       4.     16     17     16     15     14     13     12     11     10     9     8     7     6     5     4     3     2   <                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | z.<br>Pool substrate<br>characterization          | Modure<br>materia<br>and fim<br>root ma<br>submet<br>commo                                                                                                                                                                                                                                   | koli subs<br>ds. with<br>hisand p<br>ts and<br>rgeoi veg<br>in. | trale<br>gravel<br>xevela<br>jalatio                                                                                                                                                                                                   | art<br>n                                                                                                                                                                                               | Mixt<br>muc<br>be d<br>male<br>vege                                                                                                                                                                                                    | ure of<br>for cla<br>komina<br>s and<br>s and<br>s afor | i sofi s<br>ay, ma<br>ant; s<br>suten<br>u presi<br>-                                                                                                               | sand,<br>vd maj<br>ome ro<br>erged<br>ert                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | )<br>ist | Allin<br>botx<br>mac<br>vage                        | kuci or<br>Imi, lät<br>I no st<br>Station                                                                                                                        | r dayı<br>Selori<br>abmer<br>L     | or sar<br>no roa<br>geci      | n:S<br>It | Har<br>bec<br>Yeg        | rd-pa<br>xook<br>yelasi     | an cla<br>Cinos<br>Ori, | 6y or`<br>2001 (*      | sei o        | r  |
| 3.       Even mix of large shalow, large-deep, small-shalow, ange-deep, smallow, ange-deep, small-shaow, ange-deep, small-shalow, a                                                                                        | SCORE                                             | 20 1                                                                                                                                                                                                                                                                                         | 9   18                                                          | 17                                                                                                                                                                                                                                     | 16                                                                                                                                                                                                     | 15                                                                                                                                                                                                                                     | <b>t4</b>                                               | 16)                                                                                                                                                                 | 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 11       | 10                                                  | 9                                                                                                                                                                | 8                                  | 7                             | 6         | 5                        | 4                           | 3                       | 2                      | 1            | Γ  |
| SCORE     20     19     18     17     16     15     14     13     12     11     10     9     8     7     6     5     4     3     2       4.     Liste or to endrogenent<br>of is and to point tars<br>and less than 20% of the<br>bottom attested by<br>is domential deposition in<br>potom attested by<br>is domenent deposition in pois.     Some new transition<br>mew gravel, sand or fire<br>address than 20% of the<br>bottom attested by<br>is domenent deposition in<br>potom attested by<br>is domenent deposition in pois.     Moderate deposition of<br>new gravel, sand or fire<br>address than 20% of the<br>bottom attested by<br>is domenent deposition in pois.     Plasty deposition<br>new gravel, sand or fire<br>address than 20% of the<br>bottom attested by<br>is domenent deposition in pois.     Plasty deposition of<br>new gravel, sand or fire<br>address than 20% of the bottom<br>attested in proses.       SCORE     20     19     18     17     15     14     13     12     11     10     9     8     7     6     5     4     3     2       SCORE     20     19     18     17     15     14     13     12     11     10     9     8     7     6     5     4     3     2       SCORE     20     19     18     17     15     14     13     12     11     10     9     8     7     6     5     4     3     2 <tr< td=""><td>3.<br/>Pool variability</td><td>Even m<br/>shaloe<br/>smal-s</td><td>ix of lan<br/>, lange-c<br/>inetow,</td><td>ge<br/>Seep,<br/>Sma®-<br/>Sma®-</td><td></td><td>Maji<br/>deeş</td><td>ority c<br/>D: Ver</td><td>t poole<br/>y few s</td><td>s larça<br/>Shafo</td><td>ь.<br/>ж.</td><td>Sha<br/>nron<br/>deep</td><td>e prev<br/>e prev</td><td>ocis m<br/>raier:1 "<br/>5.</td><td>han<br/>Tran</td><td></td><td>Ma<br/>S'ia</td><td>(orty<br/>alon</td><td>or pi<br/>or pi</td><td>colts s<br/>xois ai</td><td>1143<br/>1382</td><td>¢.</td></tr<>                                                                                                                                                                                                                                                             | 3.<br>Pool variability                            | Even m<br>shaloe<br>smal-s                                                                                                                                                                                                                                                                   | ix of lan<br>, lange-c<br>inetow,                               | ge<br>Seep,<br>Sma®-<br>Sma®-                                                                                                                                                                                                          |                                                                                                                                                                                                        | Maji<br>deeş                                                                                                                                                                                                                           | ority c<br>D: Ver                                       | t poole<br>y few s                                                                                                                                                  | s larça<br>Shafo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ь.<br>ж. | Sha<br>nron<br>deep                                 | e prev<br>e prev                                                                                                                                                 | ocis m<br>raier:1 "<br>5.          | han<br>Tran                   |           | Ma<br>S'ia               | (orty<br>alon               | or pi<br>or pi          | colts s<br>xois ai     | 1143<br>1382 | ¢. |
| 4.       Liste or no enlargement<br>of is and so point bars<br>and less than 20% of the<br>bottom attected by<br>sedment deposition.       Some new transise in<br>bits and so point bars<br>and less than 20% of the<br>bottom attected by<br>sedment deposition.       Moderate deposition of<br>mew gravel, sand or fine<br>sedment (20 50% of the<br>bottom attected by<br>sedment deposition in pools.       Heavy deposits i<br>material, norraes<br>sedment (20 50% of the<br>bottom attected by<br>sedment deposition.       Heavy deposits i<br>material, norraes         SCORE       (20) 149       16       17       16       15       14       13       12       11       10       9       8       7       5       4       3       2         SCORE       (20) 149       16       17       16       15       14       13       12       11       10       9       8       7       5       5       4       3       2         SCORE       (20) 19       18       17       15       14       13       12       11       10       9       8       7       5       5       4       3       2         Score       20       19       18       17       15       14       13       12       11       10       9       8       7       5       4       3       2         Score       22% of channel<br>substra                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | SCORE                                             | 20 1                                                                                                                                                                                                                                                                                         | 9 18                                                            | 17                                                                                                                                                                                                                                     | 16                                                                                                                                                                                                     | 15                                                                                                                                                                                                                                     | 14                                                      | 13                                                                                                                                                                  | 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 11       | 10                                                  | 9                                                                                                                                                                | ß                                  | 7                             | 6         | 5                        | 4                           | 31                      | ( <sup>2</sup> )       | 1            | Γ  |
| SCORE     (23)     19     18     17     15     14     13     12     11     10     9     8     7     6     5     4     3     2       5.     Water reaches base of<br>Channel flow<br>status     Water reaches base of<br>both lowsr banks, and<br>minimal amount of<br>channel stotstrate is<br>exposed.     Water risk >75% of the<br>available channel,<br>substrate is exposed.     Water risk 25-75% of the<br>available channel,<br>and/or riffle substrates<br>are mostly exposed.     Vory Stele eater in<br>channel and most<br>present as stand<br>present as stand<br>provide       SCORE     20     19     18     17     15     14     13     12     11     10     9     8     7     6     5     4     3     2       SCORE     20     19     18     17     15     14     13     12     11     10     9     8     7     6     5     4     3     2       6.     Channel and row<br>of redging absension<br>in the stream with<br>of the fore abstreams,<br>of the fore abstreams,     8     7     6     5     4     3     2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 4.<br>Sediment<br>deposition                      | Litile or no enlargement<br>of is and sor point bars<br>and less than 20% of the<br>bottom attleted by<br>sedement deposition                                                                                                                                                                |                                                                 | Source new 421 ease if<br>bar formation, mostly<br>from grave, sand or fine<br>section grave, sand or fine<br>section and the section of the<br>bottom affected; sight<br>deposition in people.                                        |                                                                                                                                                                                                        | new grade, sand or fire<br>sectment or, det and<br>new bars; 50-30% of the<br>bottom effected,<br>sectment deposits at<br>obstructions,<br>constitutions,<br>constitutions,<br>and bends;<br>moterate deposition in<br>posis prevented |                                                         | di<br>Ine<br>Ihe<br>ds;                                                                                                                                             | <ul> <li>reary deposes of immediate increased biological increased biological increased biological increases and the second</li></ul> |          | fine<br>i bar<br>i bar<br>i bar<br>h<br>fi c<br>men | i an<br>Une R                                                                                                                                                    |                                    |                               |           |                          |                             |                         |                        |              |    |
| 5,     Water reaches base of<br>Channel flow<br>status     Water reaches base of<br>Dots lower barks, and<br>minimal amount of<br>channel stuburate is     Water risk >75% of the<br>available channel<br>and/or riffe substrates     Water risk 25-75% of the<br>available channel<br>and/or riffe substrates     Very Stle water in<br>channel and moti<br>present as stand<br>present as stand<br>present       SCORE     20     19     18     17     15     14     13     12     11     10     9     8     7     6     5     4     3     2       SCORE     20     19     18     17     15     14     13     12     11     10     9     8     7     6     5     4     3     2       Channel<br>alternation     Or encelization or<br>minimal stream with<br>of the dyne abstrate is     Sume channelization<br>of the dyne abstrate is,<br>or shoring structures     0     8     7     6     5     4     3     2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | SCORE                                             | [22]1                                                                                                                                                                                                                                                                                        | 9 18                                                            | 17                                                                                                                                                                                                                                     | 18                                                                                                                                                                                                     | 15                                                                                                                                                                                                                                     | 14                                                      | []                                                                                                                                                                  | 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 11       | 10                                                  | 9                                                                                                                                                                | 8                                  | 7                             | Б         | 5                        | 4                           | 3                       | 2                      | 1            | ſ  |
| SCORE         20         13         18         17         15         14         13         12         11         10         9         8         7         6         5         4         3         2           6.         Chancelization or<br>dredging absend or<br>mit met, stream with<br>of bridge absendues         Sume chancelization<br>present, stream with<br>of bridge abstreams; or shoring structures         Banks store with<br>addressing         Banks store with<br>a                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 5.<br>Channel flow<br>status                      | Water<br>both lo<br>minima<br>chanse<br>expose                                                                                                                                                                                                                                               | raaches<br>ver bari<br>I amoun<br>S subsir<br>G                 | base<br>Ios, an<br>fi of<br>ale is                                                                                                                                                                                                     | of<br>d                                                                                                                                                                                                | Wa<br>2096<br><25<br>SUD                                                                                                                                                                                                               | er tils<br>Sable i<br>% of o<br>strate                  | s >755<br>dharan<br>dharan<br>dharan<br>is eug                                                                                                                      | s of the<br>est or<br>el<br>xosect                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | e        | Wa<br>avai<br>and<br>arei                           | er fiðs<br>æbie o<br>for riff<br>mostly                                                                                                                          | : 25-7<br>chann<br>9 sub<br>1 eopo | stad<br>ei,<br>strate<br>sed. | lae<br>s  | Ver<br>che<br>pre<br>pot | ) SJ<br>amel<br>sent<br>SS. | e #2<br>  and<br>  as s | terin<br>most<br>tandr | 9<br>9       | -  |
| 6. Oranseization or Some chameization Oranseization may be Banks shored will<br>Champel directing absorb or present, usually in zees extensive, ambanicments gabion or center<br>affanetico. Initiante, stream will be of bridge absorbents; or shoring structures 20% of the stream<br>of bridge absorbents; or shoring structures 20% of the stream<br>of bridge absorbents; or shoring structures 20% of the stream<br>of the stream biotection of bridge absorbents; or shoring structures 20% of the stream<br>of the stream biotection of bridge absorbents; or shoring structures 20% of the stream<br>of the stream biotection of the stream biotection of the stream biotection of the stream biotection of the stream biotection of the stream biotection of the stream biotection of the stream biotection of the stream biotection of the stream biotection of the stream biotection of the stream biotection of the stream biotection of the stream biotection of the stream biotection of the stream biotection of the stream biotection of the stream biotection of the stream biotection of the stream biotection of the stream biotection of the stream biotection of the stream biotection of the stream biotection 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                                                                                                                                                                                                                                                          | 11       | 10                                                  | 9                                                                                                                                                                | \$                                 | 7                             | 6         | 5                        | 4                           | 3                       | 2 (                    |              | Ī  |
| evidence of past presers on both banks: channelized and<br>channelization; i.e. and 40 to 60% of stream dampted. Instre<br>dredging (presers than tech channelized and habits greatly all<br>Z) yn arg to preser,<br>channelization; is not<br>preserv.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6.<br>Channel<br>alteration                       | Chancelization or<br>driedging absent or<br>minimal stream with<br>normal pattern.                                                                                                                                                                                                           |                                                                 |                                                                                                                                                                                                                                        | Some chamelaction<br>preserv, study in zees<br>of bridge abutments;<br>exidence of past<br>chamelaction, i.e.<br>desiging (greater than<br>Z) yi) σαγ be preserv,<br>but recent<br>chamelaction is not |                                                                                                                                                                                                                                        | 235<br>n                                                | Unanciezation may be<br>extensive, ambankments<br>or shoring structures<br>present on both banks;<br>and 40 ho 005 or stream<br>reach channelized and<br>disrupted. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |          | e<br>ents<br>s:<br>com                              | earns shored with<br>gabion or center); over<br>80% of the stream reach<br>chamelaced and<br>dampled. Instream<br>thoris: greatly allered or<br>transed entirely |                                    |                               |           |                          |                             |                         |                        |              |    |
| SCORE 20 19 (13) 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | SCORE                                             | 20 1                                                                                                                                                                                                                                                                                         | 9 (18)                                                          | <sup>k</sup> 17                                                                                                                                                                                                                        | 16                                                                                                                                                                                                     | 15                                                                                                                                                                                                                                     | 14                                                      | 13                                                                                                                                                                  | 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                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#### AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 11 Site No. \_\_\_\_\_\_ Date \_\_\_\_\_

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USEPA Habitat Assessment Circle a score for each parameter

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### LOW GRADIENT STREAMS

Page 2 of 2

| Habitat                                             | Excellent                                                                                                                                                                                                                                                                                           |    |                                                                                                                                                                                                                                                                                                                | Condition category                                                                                                              |                                                           |                                                                                                                                                                                                                       |                                                                                                                        |                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                  |                                            |            |
|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|------------|
| parameter                                           |                                                                                                                                                                                                                                                                                                     |    |                                                                                                                                                                                                                                                                                                                |                                                                                                                                 | Good                                                      |                                                                                                                                                                                                                       |                                                                                                                        | Faiz                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                  | Poor                                       |            |
| 7.<br>Channel<br>sinuosity                          | The bands in the stream<br>increase the stream<br>length 3 to 4 times<br>know that it treas in a<br>straight line. (Mote –<br>channel braiding is<br>considered normal in<br>coastal plains and other<br>low-lying areas. This<br>parameter is not easily<br>rated in these areas).                 |    |                                                                                                                                                                                                                                                                                                                | The ben<br>increase<br>length 2<br>konger th<br>straight!                                                                       | ds in the<br>otherstree<br>lo 3 time<br>tan 8 the<br>line | stream<br>ann<br>%<br>as ir a                                                                                                                                                                                         | The ber<br>increase<br>2 tenes<br>was in a                                                                             | nds in line<br>e the strat<br>konger lin<br>a stranght | stream<br>an 1 to<br>av řit<br>Ene.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Charne<br>waterwi<br>charne<br>disianci                                                                                                                          | i straight<br>ay has ba<br>ized 'or a<br>e | an<br>Kang |
| SCORE                                               | 20 15 16                                                                                                                                                                                                                                                                                            | 17 | · 16                                                                                                                                                                                                                                                                                                           | 15 14                                                                                                                           | 13                                                        | 12 11                                                                                                                                                                                                                 | 10 9                                                                                                                   | 8                                                      | 7Б                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 5 4                                                                                                                                                              | 3 2                                        | 10         |
| 8.<br>Bank stability<br> score each bank)           | Banks stable: evidence<br>of erosion or bank failure<br>absent or minimal: 80e<br>potential for faulte<br>problems. <5% of bank<br>affected.                                                                                                                                                        |    |                                                                                                                                                                                                                                                                                                                | Mooraley state;<br>infrequent, small areas<br>of ension mostly heated<br>over, 5-30% of bank in<br>reach has areas of<br>ension |                                                           |                                                                                                                                                                                                                       | Vectorately unstable; 30-<br>60% of bank in reach<br>has a was of errorion,<br>high erosion potential<br>during foods. |                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Justable, many knoded<br>areas; "rew" areas<br>frequent along straight<br>sections and bends;<br>obvious bank sloughing;<br>60-100% of bank has<br>antimities as |                                            |            |
| SCORE                                               | ුළේ, සිනාk                                                                                                                                                                                                                                                                                          | 10 | 9                                                                                                                                                                                                                                                                                                              |                                                                                                                                 | 7                                                         | 6                                                                                                                                                                                                                     | 5                                                                                                                      | 4                                                      | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2                                                                                                                                                                | 1                                          | 0          |
| SCORE                                               | Right bank                                                                                                                                                                                                                                                                                          | 10 | 9                                                                                                                                                                                                                                                                                                              | 8                                                                                                                               | ?                                                         | 0                                                                                                                                                                                                                     | 5                                                                                                                      | 4                                                      | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2                                                                                                                                                                | 1                                          | 0          |
| 9.<br>Vegelative<br>protection<br>(score each bank) | Use that 90% of the<br>streambark surfaces<br>and immediate riparian<br>zone covered by makive<br>vegetation, including<br>treas, inclusiony<br>structs, or now woody<br>macrophytes; vegetative<br>struction through<br>grazing or mowing<br>minimal or not evident;<br>almost all gitents allowed |    | 170-00% of the<br>streambark surfaces<br>covered by native<br>regetation, but one class<br>of plants is not we%-<br>represented; disruption<br>evident but not affecting<br>that plant growth covers?iil<br>to any grast extent;<br>more than one had of<br>the potential plant;<br>should have be<br>common a |                                                                                                                                 |                                                           | streambank surfaces<br>covered by vegetation;<br>disruption obvious;<br>patches of bare soil or<br>closely cropped<br>vegetation comport, less<br>than one-had of the<br>potential plant stubble<br>height remaining. |                                                                                                                        |                                                        | Less son tops of the<br>streamback surface<br>covered by vegetation;<br>disruption of sineamback<br>vegetation; law any light<br>vegetation;                                                                                                                                                                 |                                            |            |
| SCORE                                               | Left bank                                                                                                                                                                                                                                                                                           | 10 | 9                                                                                                                                                                                                                                                                                                              | $\odot$                                                                                                                         | 7                                                         | 6                                                                                                                                                                                                                     | 5                                                                                                                      | 4                                                      | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2                                                                                                                                                                | 1                                          | 0          |
| SCORE                                               | Rig'n bank                                                                                                                                                                                                                                                                                          | 10 | 5                                                                                                                                                                                                                                                                                                              | $\left  \begin{array}{c} \bullet \\ \bullet \end{array} \right $                                                                | 7                                                         | 6                                                                                                                                                                                                                     | 5                                                                                                                      | 4                                                      | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2                                                                                                                                                                | 1                                          | 0          |
| 10.<br>Riparian zone<br>score<br>(score each bank)  | Width of riparian zone<br>>18-metres; human<br>activities (i.e. mads,<br>anns props etc.) have<br>not impacted the riparian<br>zone                                                                                                                                                                 |    |                                                                                                                                                                                                                                                                                                                | With of riperian zone<br>12-18 metres homan<br>activities have impacted<br>the riparian zone only<br>criteinety.                |                                                           |                                                                                                                                                                                                                       | Witch of riparian cone 6-<br>12 metres; human<br>activities have impacted<br>the riparian zone a great<br>deal.        |                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | With of nparian zone<br>< S metres; title of no<br>parian vegetation is<br>present because of<br>human activities.                                               |                                            |            |
| SCORE                                               | Left bank                                                                                                                                                                                                                                                                                           | 10 | ç                                                                                                                                                                                                                                                                                                              | \$                                                                                                                              | 7                                                         | 6                                                                                                                                                                                                                     | 5                                                                                                                      | 4                                                      | Q                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2                                                                                                                                                                | 1                                          | 0          |
| SCORE                                               | Righl bank                                                                                                                                                                                                                                                                                          | 10 | ş                                                                                                                                                                                                                                                                                                              | \$                                                                                                                              | 7                                                         | 6                                                                                                                                                                                                                     | $\overline{\mathbb{O}}$                                                                                                | 4                                                      | لجزيركم                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 2                                                                                                                                                                | 1                                          | 0          |
|                                                     |                                                                                                                                                                                                                                                                                                     |    |                                                                                                                                                                                                                                                                                                                |                                                                                                                                 |                                                           |                                                                                                                                                                                                                       |                                                                                                                        |                                                        | Ø                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                  |                                            |            |

TOTAL LOW GRADIENT HABITAT SCORE

Date 20.09.17

Channel cross-sections and variables to be measured in the area around a cross section

Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at homogeneous sampling sites (generally kwill differently kwill dif

Site No.

| _                                                      | Cross-section sketch                                                                                                            |                                                                                                                                     | Cross          | s-section number of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                        |                                                                                                                                 |                                                                                                                                     | Type of Riffie | bedform at the cross-section                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Bark height (m)                                        | The channel sketch should show in pross<br>the water surface, matermark and barried,<br>cutorops and snags encountered at the o | -section the shape of the channel and include the location of<br>points. Also show other fastures such as bars, rocky<br>tos sector | Stream         | Bankfull channel width (m)<br>(=total of boxes A+B+C)<br>m width at the water mark (m) $2 \cdot 5_{A}$<br>width at the water surface (m) $2$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Bank<br>width (m)                                      |                                                                                                                                 |                                                                                                                                     |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| between the water<br>surface and the<br>water mark (m) | Vertical water                                                                                                                  | ceptins (cm)                                                                                                                        |                | Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical distance       Image: Wertical |
| <b>Riparian zone width</b><br>Left bank <u>(m)</u> F   | Right bank <u>(O</u> (m)                                                                                                        | Notes on cross-section measure                                                                                                      | ement          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Bank material Assess                                   | % composition for each bank<br>Left bank Right bank                                                                             | Substrate composition<br>Assess % composition in the area of bed 5m eith<br>the cross-section.                                      | er side of     | Assess in the area 5m either side of<br>Filamentous algae cover Life cross section<br>10% 10-35% 35-65% 65-90% >90%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Boulder (>256mm)<br>Cobble (64-256mm)                  |                                                                                                                                 | Bedrock         Cobble (64-256mm)           Cobble (64-256mm)         [                                                             |                | Periphyton cover                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Pebble (16-64mm)<br>Gravel (2-16mm)<br>Sand (0.06-2mm) | 1212<br>1212<br>1212<br>1212                                                                                                    | Pebble (16-64mm)<br>Gravel (2-16mm)<br>Sand (0.06-2mm)                                                                              |                | Moss cover<br><10%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Fines (silt and clay, <0.06mm                          | 1) <u>70</u> <u>70</u><br>Total 100% each                                                                                       | Fines (silt and day <0.06mm)                                                                                                        | <u>,0</u> )    | Detritus cover<br>√<10%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

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Site No.

#### Channel cross-sections and variables to be measured in the area around a cross section

Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at thomogeneous sampling siles (generally lowland streams) and three cross-sections at heterogeneous sampling siles (generally upland streams). Where the water level at the time of sampling is at or near the water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

|                                                                             | Cross-section sketch                                                                                                          |                                                                                                                                       | Cros            | s-section number                                                                                                         | of                                                                          |
|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
|                                                                             |                                                                                                                               |                                                                                                                                       | Type of         | bedform at the cross-section                                                                                             | er                                                                          |
| Bank height (m)                                                             | The channel sketch should show in cross<br>The water surface, watermark and backfu<br>outcrops and snays encountered at the c | section the shape of the channel and include the location of<br>Locinis. Also show other features such as bars, roday<br>tass section | Strea<br>Stream | Bankfull channel width (m)<br>(=total of boxes A+B+C)<br>m width at the water mark (m)<br>width at the water surface (m) | Bank height (m                                                              |
| Bank width (m)                                                              | Horizonial dis                                                                                                                |                                                                                                                                       |                 |                                                                                                                          | Bank<br>width (m)                                                           |
| Vertical distance<br>between the water<br>surface and the<br>water mark (m) |                                                                                                                               |                                                                                                                                       |                 |                                                                                                                          | Vertical distance<br>between the water<br>surface and the<br>water mark (m) |
| Riparian zone width                                                         |                                                                                                                               | Notes on cross-section measured                                                                                                       | rement          |                                                                                                                          |                                                                             |
| Left bank (m) R                                                             | Right bank (m)                                                                                                                |                                                                                                                                       |                 |                                                                                                                          |                                                                             |
| Bank material Assess                                                        | % composition for each bask<br>Left bank Right bank                                                                           | Substrate composition<br>Assess % composition in the area of bed 5m ei<br>the cross-section.                                          | ther side of    | Assess<br>Filamentous algae cover                                                                                        | s in the area 5m either side of<br>the cross section<br>65-90% >90%         |
| Bedrock                                                                     |                                                                                                                               | Bedrock                                                                                                                               | )               |                                                                                                                          |                                                                             |
| Boulder (>256mm)                                                            |                                                                                                                               | Boulder (>256mm)                                                                                                                      |                 | Periphyton cover                                                                                                         |                                                                             |
| Cobble (64-256mm)                                                           |                                                                                                                               | Cobble (64-256mm)                                                                                                                     | %               | <10%10−35%35-65%                                                                                                         | 65-90% []>90%                                                               |
| Pebble (16-64mm)                                                            |                                                                                                                               | Pebble (16-64mm)                                                                                                                      | }               | Moss cover                                                                                                               |                                                                             |
| Gravel (2-16mm)                                                             |                                                                                                                               | Gravel (2-16mm)                                                                                                                       | 그 다             | □<10% □10–35% □35-65%                                                                                                    | □65-90% □>90%                                                               |
| Sanc (0.06-2mm)                                                             |                                                                                                                               | Sand (0.06-2mm)                                                                                                                       |                 |                                                                                                                          |                                                                             |
| FIΩ⊖S (silt and clay, <0.06mm                                               | )<br>میں کی کرچک<br>Total 100% each                                                                                           | Finces (silt and clay <0.06mm)                                                                                                        | }               | Detritus cover                                                                                                           | 65-90% >90%                                                                 |

Date

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Channel cross-sections and variables to be measured in the area around a cross section

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Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at homogeneous sampling sites (generally lowland streams) and three cross-sections at heterogeneous sampling sites (generally upland streams). Where the water level at the time of sampling is at or near the water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

|                                                                                                   | Cross-section sketch                                                                                                                           |                                                                                                                                                  | Cros                        | s-section number                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | of                                                                       |
|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| ark height (m)<br>Bank                                                                            | The channel stetch should show in cost<br>the water surface, watermark and bankfu<br>outpraps and snags encountered at the o<br>Hosizontal dis | -section the shape of the channel and include the location of<br>Spotns. Also show other features such as bars, rocky<br>toos section            | Type of<br>Riffle<br>Stream | bedform at the cross-section<br>Run Pool Cascade Other<br>Bankfull channel width (m)<br>(=total of boxes A+B+C)<br>m width at the water mark (m)<br>width at the water surface (m)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | er<br>Bank height (                                                      |
| Verticai distance<br>etween the water<br>surface and the<br>water mark (m)<br>Riparian zone width |                                                                                                                                                | Image: Notes on cross-section measure                                                                                                            | ement                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Vertical distance<br>between the wa<br>surface and the<br>water mark (m) |
| Left bank (m) F<br>Bank material Assess<br>Bedrock<br>Boulder (>256mm)<br>Cobble (64-256mm)       | Right bank (m)<br>% composition for each bank<br>Left bank Right bank                                                                          | Substrate composition<br>Assess % composition in the area of bed 5m et<br>the cross-section.<br>Bedrock<br>Boulder (>256mm)<br>Cobble (64-256mm) | her side of                 | Assess Filamentous algae cover Second | in the area 5m either side of the cross section 65-90% >90%              |
| Hepote (16-64mm)<br>Gravel (2-16mm)<br>Sand (0.06-2mm)<br>Fines (s≋ and clay, <0.06mm             | ا)<br>                                                                                                                                         | Pebble (16-64mm)<br>Gravel (2-15mm)<br>Sand (0.06-2mm)<br>Fines (silt and clay <0.06mm)                                                          | Total 10(                   | Moss cover<br><pre></pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 65-90%>90%<br>65-90%>90%                                                 |

te No. <u>44</u> Date <u>21. 09.17</u>

| Date <u>21.09.17</u> Site No. <u>4A.</u> Time <u>0900</u><br>River Name <u>Rocky Greek</u> Location <u>E Ballard</u>                                                                                                                                                                                                                                                                                              | _ Recorder's Name <u>JS</u> + <u>LL</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Weather       Fine       Sunny       Rain in last week? Y [] N [X]       Photograph number         Latitude:       deg       min       sec                                                                                                                                                                                                                                                                        | ns and details <u>NESW</u> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| PLANFORM SKETCH OF SITE<br>Including collism types, location of cross-sections. access points. Landmarks and natural or artificial channel or floodplain features.<br>Let bark is facing downstream.<br>See photo's.<br>Note through gargoone.<br>Landwing kodeduren<br>Wille through gargoone.<br>Landwing kodeduren<br>Wille wag-tail<br>Ande doed -> land kelder.<br>Fearl deas<br>Koala.<br>Pried curriawoog. | LENGTH OF SAMPLING SITE<br>Bankfull width (m)<br>x 10<br>Length of sampling site 100 (m)<br>Notes<br><u>Abris form floads in the well</u><br><u>Method forth abbestos sheeting</u><br><u>Method forth abbe</u> |

Acknowledgments - The content and layout of these data sheets are derived from the sheets used in the River Habitat Audit Procedure (Anderson, 1993a). AUSRIVAS, the Index of Stream Condition (Ladson and White, 1999 and DNRE Victoria) and the River Habitat Survey (Raven *et al.*, 1998).

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Site No.

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| <br>Date |  |
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| BASIC WATER CHEMISTRY                                        |                   | Valley shape<br>Choose one category only                                       | Local impacts on streams                     |
|--------------------------------------------------------------|-------------------|--------------------------------------------------------------------------------|----------------------------------------------|
|                                                              |                   |                                                                                |                                              |
|                                                              | °C                | Steep valley                                                                   | Sand or gravel mining                        |
| Conductivity                                                 |                   |                                                                                | Other mining Channel straightening           |
| Dissolved Oxygen                                             | mg l⁻¹            | Shallow valley                                                                 | Road River improvement works                 |
| Dissolved Oxygen Sat.                                        | %                 |                                                                                | Bridge / culvert / wharf Water extraction    |
| рН                                                           |                   | Broad valley                                                                   | Ford / ramp Dredging                         |
| Turbidity                                                    |                   |                                                                                | Discharge pipe 🛛 🕅 Grazing                   |
| Total phosphorus ☐ 🛱 ⊱                                       |                   | Gorge                                                                          | Forestry activities X Litter - Food childres |
| Total nitrogen                                               |                   | V T                                                                            | Sugar mill Recreation                        |
|                                                              |                   | Symmetrical                                                                    | Irrigation run-off or                        |
| Amount of water                                              | ml                |                                                                                | pipe outlet                                  |
| Amount of H <sub>2</sub> SO <sub>4</sub>                     | ml                | Asymmetrical                                                                   |                                              |
| Alkalinity                                                   | ma t <sup>1</sup> | floodplain                                                                     |                                              |
|                                                              | uig i             |                                                                                | Local landuse                                |
|                                                              |                   |                                                                                | Choose one category for each bank            |
| Floodplain width                                             | ·                 | Average (m)                                                                    | Left Right                                   |
| Floodplain features                                          |                   |                                                                                | Native forest                                |
| Choose one or more features when present                     |                   |                                                                                | Native grassland (not grazed)                |
| $\underline{	imes}$ Sampling site has no distinct floodplain |                   | roll systems                                                                   | K Grazing (native or non-native pasture)     |
| Oxbows / billabongs                                          | aloi              | ng the inner bank of a stream meander                                          | Exotic grassland (lawns etc., no grazing)    |
| meander, isolated by a shift in the stream                   | Sp Sp             | lays                                                                           | Forestry Native [ ][ ] Pine [ ][ ]           |
|                                                              | Sm                | all alluvial fan formed where an<br>vloaded stream breaks through a levee      | Cropped Rainfed [ ] [ ] Irrigated [ ] [ ]    |
| Ecroped during a previous bydrological                       | and               | deposits material on the floodplain                                            | Urban residential                            |
| regime. May be infilled with sediment                        | Flo               | odplain scours                                                                 |                                              |
| Flood channels                                               | So<br>cle         | our holes formed by the concentrated aring and diagong action of flowing water | Industrial or intensive agricultural         |
| A channel that distributes water onto the floodolain durino  |                   | findplain features present                                                     |                                              |
| floods                                                       | Flo               | podplain present at the sampling site but                                      |                                              |
|                                                              | doe               | es not contain any of the above features                                       |                                              |

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#### Longitudinal extent of riparian vegetation



## Regeneration of native woody vegetation

Is the sampling site in undisturbed forest?



### Overall vegetation disturbance rating

Choose one category only. Sites with valley vegetation cleared on BOTH sides, but with riparian vegetation in good condition should be scored in the high disturbance category. Words within the drawings summarise the detailed text about the state of the riparian and valley vegetation for each category.



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Site No. Date





Note: An additional response variable <u>planform channel pattern</u> is measured in the office

#### \_ Date <u>21.09.17</u> 4A. Site No.

| Bed compaction<br>Chocse one category only                                                                                                      | Sediment matrix<br>Choose one category only                                                                | Sediment angularity<br>Choose one category only |
|-------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| Tightly packed, armoured<br>Array of sediment sizes,<br>overlapping, lightly packed and<br>very hard to dislodge                                | Bedrock                                                                                                    | Assess cobble, pebble and                       |
| Packed, unarmoured<br>Array of sediment sizes,<br>overlapping, tightly packed but<br>can be d'slodged with moderate                             | Open framework<br>0-5% fine sediment, high<br>availability of interstitia spaces                           | Angi                                            |
| Moderate compaction<br>Array of sediment sizes, little<br>overlapping, some packing but<br>can be dislodged with moderate                       | Matrix filled contact<br>framework<br>5-32% fine sediment, moderate<br>availability of interstitial spaces | Rour                                            |
| Low compaction (1)<br>Limited range of sediment<br>sizes, little overlapping, some<br>packing and structure but can<br>be dislodged very easily | Framework dilated<br>32-60% fine sediment, low<br>availability of interstitial spaces                      | Well                                            |
| Low compaction (2)<br>Loose array of fine sediments,<br>no overlapping, no packing and<br>structure and can be dislodged                        | Matrix dominated<br>>60% fine sediment, interstitial<br>spaces virtually absent                            | In the USEPA Hab                                |
| very easily                                                                                                                                     |                                                                                                            | In the USEPA<br>following pages, be             |

Bed stability rating Choose one category only

# Unstable - eroding

| <br>Assess cobble, pebble and gravel fractions on | ly |
|---------------------------------------------------|----|
| Very angular                                      |    |



In the USEPA Habitat Assessment on the bllowing pages, be sure to use the correct form for high or low gradient streams



Unstable - depositing

| Severe erosion                   | Moderate erosion                    | Bed stable                           | Moderate deposition                 | Severe deposition                    |
|----------------------------------|-------------------------------------|--------------------------------------|-------------------------------------|--------------------------------------|
| Streamoed scoured of fine        | Little fine sediment present. Signs | A range of sediment sizes present in | Moderate build-up of fine sediments | Extensive build up of fine sediments |
| sed ments. Signs of channel      | of channel deepening. Eroded        | the streambed. Channel is in a       | at obstructions and bars.           | to form a flat oed. Channel blocked, |
| deepening. Bare, severely eroded | banks. Streambed deep and           | relatively natural state (not        | Streambed flat and uniform.         | but wide and shallow. Bars large     |
| banks. Erosion heads. Steep      | narrow. Steep streambed             | deepened or infilled). Bed and bar   | Channel wide and shallow.           | and covering most of the bed or      |
| streambed caused by erosion.     | comprised of unconsolidated         | sediments are roughly the same       |                                     | banks. Streambed comprised of        |
|                                  | (loosely arranged and unpacked)     | size. Banks stable. Streambed        |                                     | unconsolidated (loosely arranged     |
|                                  | material                            | comprised of consolidated            |                                     | and unpacked) material.              |
|                                  |                                     | (tightiy arranged and packed)        |                                     |                                      |
|                                  | 1                                   | material.                            |                                     |                                      |

- Stable

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#### USEPA Habitat Assessment Circle a score for each parameter

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## HIGH GRADIENT STREAMS

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| Habita.                                            |                                                                                                                                                       |                                                                                                                                                                                                                                                                                                              |                                |                                                                                                                     |                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                 | c    | onti | tion                          | cate                                                            | gory                                                                                                                                                                                                                     |                                    |                                |          |                                                                          |   |                                                                                                                                                                                               | -     |   |   |  |  |
|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|---------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-------------------------------|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|--------------------------------|----------|--------------------------------------------------------------------------|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|---|---|--|--|
| paramete.                                          |                                                                                                                                                       | 20                                                                                                                                                                                                                                                                                                           | ent                            |                                                                                                                     | [                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                 | Good | 1    |                               |                                                                 |                                                                                                                                                                                                                          | Fai:                               |                                |          |                                                                          |   | Po                                                                                                                                                                                            | n ree |   |   |  |  |
| f,<br>Epifarenal<br>substrate (<br>avaifable cover | Greater  <br>substrail<br>epifaurai<br>fish cove<br>submarg<br>banks, c<br>stable ha<br>io atow 1<br>potential<br>that are<br>not para                | Greater than rules or<br>substrate fevourable for<br>epifaunal colonisation and<br>fish cover, mix of snags,<br>submarged logs, undersut<br>banks, cobbe or other<br>stable habital and as slage<br>to a fave full colonisation<br>potential (i.e. logs/smags<br>that are not new fail and<br>not luranism). |                                |                                                                                                                     | 45-70% mix of stable<br>rabitative3-sulter for<br>full ordensiation<br>potential, adequate<br>habitat for nextratance<br>of populations; presence<br>of additional substrate in<br>the 50m of nextrat, but<br>not yet prepared for<br>colorisation (may rate at<br>high-end of scale). |                                                                                                                                                                                                                 |      |      |                               | 20-4<br>hab<br>avai<br>desi<br>freq<br>rech                     | Less fran 20% stable<br>frantiat, lack of rabiat is<br>obvious; judstrate<br>unstable or lacking                                                                                                                         |                                    |                                |          |                                                                          |   |                                                                                                                                                                                               |       |   |   |  |  |
| SCORE                                              | 20 19                                                                                                                                                 | 18                                                                                                                                                                                                                                                                                                           | 17                             | 1-6                                                                                                                 | 15                                                                                                                                                                                                                                                                                     | 14                                                                                                                                                                                                              | 13   | 12   | 11                            | 20                                                              | 9                                                                                                                                                                                                                        | 3                                  | 7                              | 6        | 5                                                                        | 4 | 3                                                                                                                                                                                             | 2     | 1 | 0 |  |  |
| 2.<br>Embeddedness                                 | Gravel, cobride and<br>boubler pertides are 0-<br>26% surrounded by free<br>sediment. Layering of<br>cobble provides <i>Charsky</i><br>of mohe space. |                                                                                                                                                                                                                                                                                                              |                                |                                                                                                                     | Gra<br>50%                                                                                                                                                                                                                                                                             | Gravel, cobble and<br>bottler particles are 25-<br>50% surrounded by fine<br>sectiment.                                                                                                                         |      |      |                               |                                                                 | Gravel, cobble and<br>boulder particles are 50-<br>75% sumbunded by fine<br>sediment.                                                                                                                                    |                                    |                                |          |                                                                          |   | Grave, cooble and<br>boulder particles are<br>more chan 75%<br>sumounded by free<br>sediment.                                                                                                 |       |   |   |  |  |
| SCORE                                              | 20 19                                                                                                                                                 | 18                                                                                                                                                                                                                                                                                                           | 17                             | 16                                                                                                                  | 15                                                                                                                                                                                                                                                                                     | 14                                                                                                                                                                                                              | 13   | 12   | 11                            | 50                                                              | 9                                                                                                                                                                                                                        | ŧ                                  | 7                              | 6        | 5                                                                        | 4 | 3                                                                                                                                                                                             | 2     | 1 | Ð |  |  |
| 3.<br>Velocity / depth<br>regime                   | Al four velocit-idepth<br>regimes present (slow-<br>oesp, slow-shatow, fast-<br>desp, fast-shatow, 5kow<br>is <0.5m/s, desp is<br>>0.5m/              |                                                                                                                                                                                                                                                                                                              |                                | Chiy 3 of the 4 regimes<br>present (if fest-shabow is<br>missing, score-kower<br>than if missing other<br>regimes). |                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                 |      |      | Only<br>regin<br>shat<br>aren | Dominated by 1<br>velocity/depth regime<br>(usually slow-deep). |                                                                                                                                                                                                                          |                                    |                                |          |                                                                          |   |                                                                                                                                                                                               |       |   |   |  |  |
| SCORE                                              | 20 19                                                                                                                                                 | 18                                                                                                                                                                                                                                                                                                           | 17                             | 16                                                                                                                  | 15                                                                                                                                                                                                                                                                                     | 14                                                                                                                                                                                                              | 13   | 12   | 11                            | 10                                                              | 9                                                                                                                                                                                                                        | \$                                 | 7                              | 6        | 5                                                                        | 4 | 3                                                                                                                                                                                             | 2     | : | 0 |  |  |
| 4.<br>Sediment<br>deposition                       | Liftie or a<br>islands o<br>less that<br>affected<br>depositio                                                                                        | Lifte or no extangement of<br>islands or point bars and<br>less than 5% of the bottom<br>affected by sediment<br>deposition.                                                                                                                                                                                 |                                |                                                                                                                     |                                                                                                                                                                                                                                                                                        | Some new nonesse in<br>bar formation, mostly<br>from gravel, scard or fine<br>sediment; 5-30% of the<br>ballion affected; sight<br>deposition in pools.                                                         |      |      |                               |                                                                 | Moderate deposition of<br>new gravel, sand or fine<br>sectment on tid and<br>new bars; 30-50% of the<br>battom affected;<br>sectment deposits at<br>obstructions,<br>constructions, and tends;<br>moderate deposition in |                                    |                                |          |                                                                          |   | Heavy deposits of fine<br>malerial, non-essed har<br>development; more than<br>50% of the bottom<br>Changing treatently;<br>poils atmost absent due<br>to substantial sediment;<br>deposition |       |   |   |  |  |
| SCORE                                              | 20 19                                                                                                                                                 | 18                                                                                                                                                                                                                                                                                                           | 17                             | 16                                                                                                                  | 15                                                                                                                                                                                                                                                                                     | 14                                                                                                                                                                                                              | 13   | 12   | 11                            | 10                                                              | 9                                                                                                                                                                                                                        | 8                                  | 7                              | 6        | 5                                                                        | 4 | 3                                                                                                                                                                                             | 2     | 1 | ¢ |  |  |
| 5.<br>Channel flow<br>status                       | Walerns<br>bein Iba<br>ministral<br>channei<br>exposed                                                                                                | aches :<br>er bark<br>amount<br>substra                                                                                                                                                                                                                                                                      | s, and<br>s, and<br>of<br>lets | f                                                                                                                   | Wa<br>ava<br><25<br>Sub                                                                                                                                                                                                                                                                | Water fills >75% of the<br>available channel or<br><25% of channel<br>substrate is exposed.                                                                                                                     |      |      |                               |                                                                 | ler fills<br>lable d<br>lor rifs<br>mostij                                                                                                                                                                               | i 25-7<br>thain<br>le sub<br>requi | 5% of<br>el,<br>strate<br>sed. | ihe<br>s | Very interwater in<br>channel and atosty<br>present as standing<br>pods. |   |                                                                                                                                                                                               |       |   |   |  |  |
| SCORÉ                                              | 2D 15                                                                                                                                                 | 18                                                                                                                                                                                                                                                                                                           | 17                             | 16                                                                                                                  | 15                                                                                                                                                                                                                                                                                     | 14                                                                                                                                                                                                              | 13   | :2   | 11                            | 10                                                              | 9                                                                                                                                                                                                                        | B                                  | 7                              | 6        | 5                                                                        | 4 | 1                                                                                                                                                                                             | 2     | 1 | 0 |  |  |
| 6.<br>Channel<br>alteration                        | Convelezation, or<br>directing absent or<br>minimal, preservedth<br>normal pattern.                                                                   |                                                                                                                                                                                                                                                                                                              |                                |                                                                                                                     | Son<br>pre:<br>cf b<br>cha<br>cha<br>cha<br>20)<br>but<br>cha<br>pre                                                                                                                                                                                                                   | Some charmelazation<br>present, usually in areas<br>of bridge aburments;<br>evidence of past<br>channelization, i.e.<br>checking (greater than<br>20 yr) may be present,<br>but eccent<br>charmeSization is not |      |      |                               |                                                                 | Channeszsisr, may be<br>extensive: embandments<br>or shoring structures<br>present on both barks;<br>and 40 to 60% of stream<br>reach channeszed and<br>disruptes.                                                       |                                    |                                |          |                                                                          |   | Banks shored with<br>getion or cament, over<br>80% of the stream reach<br>channelized and<br>disrupted. Instream<br>heakslightesty amend or<br>camoved entirely.                              |       |   |   |  |  |
| SCORE                                              | 20 19                                                                                                                                                 | 18                                                                                                                                                                                                                                                                                                           | 17                             | 16                                                                                                                  | 15                                                                                                                                                                                                                                                                                     | 14                                                                                                                                                                                                              | 13   | 12   | 11                            | 10                                                              | 9                                                                                                                                                                                                                        | 8                                  | 7                              | 6        | 5                                                                        | 4 | 3                                                                                                                                                                                             | 2     | 1 | 0 |  |  |

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AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 9
Site No. ______ Date ______

USEPA Habitat Assessment HIGH GRADIENT STREAMS Page

Circle a score for each parameter

| Habitat | | | | Condition category | | | | | | | | | | | | | | | |
|--|---|---|--|---|--|---|--|---|---|---|--|----------|--|---|---|-----|---|--|--|
| parameter | Exc | ellent | | [| | Good | | | | Fair | | | | | Poor | | _ | | |
| 7.
Frequency of
riffles (or bends) | Countrance of riffes
relatively frequent; ratio
of distance between
riffes divided by width of
the stream <7.0
Igeneratly 5 to 7); variety
of labitat is key. In
streams where riffes are
continuous placement
of bourders or other
large, natural obstruction
is important. | | | Osc.
intre
betw
by th
stread | urer
Quer
Rem
Remis | nce of rid
n: Costar
filles di
tin of tr
: Detwee | Ses
Ice
Video
N 7 1 | 5 | Cocasic
bollom (
some %
between
by fre w
stream i
25 | | Generally all fist water or
statility of files; poor
habits; distance
between niffes divided
by the width of the
stream is a ratio of >25. | | | | | | | | |
| SCORE | 20 19 | 18 17 | 15 | 15 | 14 | 13 | 12 | 11 | 10 9 | 8 | 7 | Ģ | 5 | 4 | 3 2 | 1 | 0 | | |
| 8.
Bank stability
(score each bank) | Banks stats
of excision o
absent or m
potential for
problems, -
affected | Vod
Sshe
of er
over,
next
eros | erate
quan
tisio
5.3
r ha
ion | sy slabe
1, smal
n mosty
30% of b
s areas | s
arez
hesi
sztici
of | s
ed
in | Moderal
60% of 1
has area
high ero
during fi | leir unsta
berk in m
as of eros
ston pota
bods. | bie; 3
sach
ion;
mial | 0- | Unstable, many erodiad
areas; itse/ areas
frequent slong straight
sections and bench;
obvious bank stoughing
60-1000; of bank has
ervisionet scars | | | | | | | | |
| SCORE | Leil bank | 10 | 8 | 8 | | 7 | | 6 | 5 | 4 | ; | 3 | 2 | | 1 | • | | | |
| SCORE | Föght bank | 10 | 9 | : 8 | | 7 | | 6 | 5 | 4 | | 3 | 2 | | 1 | į Đ | ļ | | |
| 9.
Vegetative
protection
(acceled bank) | More than 50% of 2e
streambank surfaces
and introduce industry
vegetation, including
these, understorey
sinubs, or non woody
macrophytes; vegetative
disruption through
grazing or moving
minimal or not evident
aims; all plants adoued
location at work. | | | 70-90% of the
scenarbark surfaces
covered by netwo
vegetation, but one class
of plants is not well-
represented, disruption
eviden to un not affecting
tub plant growth potential
to any great ecent
more than one had of
the potential plant
stubble height | | | | | 50-70%
streams
covered
dishuptio
patches
cosety i
vegetatio
than con
potentia
height m | of the
park surfa
l by veget
on obvious
of same s
tropped
on comm
e haif of th
i plant so
emaining | aces
ation
s;
cal ar
on; le
bale | \$5 | Less than 50% of the
streambark surfaces
overeal by vegetation;
disruption of streambark
vegetation is very high;
vegetation has been
removed to 5
centeneures of tests in
average stubble height. | | | | | | |
| SCORE | Leit bark | 10 | 9 | ļ₿ | | 7 | | 6 | 5 | 4 | | 3 | 2 | | 1 | D | | | |
| SCORE | Fight beni | 10 | 9 | B | ĺ | 7 | | 6 | 5 | 4 | | 3 | 2 | Ì | 1 | 0 | | | |
| 10.
Ripanian zome
score
(score each bank) | With of riparian zone
>13 metres; human
activities (i.e. roads,
learns, crops etc.) have
not impacted the riparian | | | Vitit
12-1
BCLV
the r
minu | V&ith of ripanan zone
12-18 metres; human
activities have impacted
the riparian zone only
minimally. | | | | | With of nparian zone 5-
12 metres; human
activities have impacted
the ritigian zone a graat
cleal | | | | | Width of riparian zone
-& mexics; attle or no
riparian vegetation is
present because of
human activities. | | | | |
| SCORE | Left bank | 10 | 9 | B | | 7 | | 6 | 5 | 4 | | 3 | 2 | 1 | 1 | a | | | |
| SCORE | Füght bank | 10 | 9 | ; B | | 7 | İ | 6 | 5 | 4 | ; | 3 | 2 | | 1 | 0 | | | |

TOTAL HIGH GRADIENT HABITAT SCORE



Page 2 of 2

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AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 10 Site No. \underline{UA} Date $\underline{\mathcal{A}l} \cdot \underline{\mathcal{O}9} \cdot \underline{\mathcal{F}}$

USEPA Habitat Assessment

| Habitat | | | | | | | | C | ond | ition | cate | egor | y | | | | | | | | | |
|---|--|--|--|--|--|---|---|--|---|----------|--|--|---|---|-----------------|---|-----------------------------------|----------------------------------|-----------------------------------|------------|----|--|
| parameter | | Ex | celle | int | | | 0 | Good | | | Fair | | | | | | Poor | | | | | |
| 1.
Epifaunal
substrate /
available cover | Greater than 50% of
substrate taxourable for
epifaunal colonisation
and fish cover, mix of
snags, submarged logs,
undercut banks, cobble
or other stable habitat
and at stage to allow full
colonisation potential
(i.e. logs/snags that are
not new fall and not
transient). | | or
18,
le
uill
re | su-outs mix of stable
habitat; well-suited for
full colonisation
potential, adequate
habitat for maintenance
of populations; presence
of additional substrate in
the form of newfall, but
not yet prepared for
colonisation (may rate at
high end of scale). | | | | 10-30% mix of stable
habitat, habitat
availability less than
desirable; substrate
frequently disturbed or
removed. | | | | | Less than 10% stable
habitat; lack of habitat is
obvious; substrate
unstable of lacking. | | | | | | | | | |
| SCORE | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 2.
Pool substrate
characterization | Mixt
mate
and
root
subr
com | ure of serials, v
firm sa
mats a
merger
mon. | subst
with g
and p
and
d veg | rate
pravel
revale
etation | nt; | Mixto
mud
be d
mats
vege | ure of
or cla
omina
s and s
station | e of soft sar
r clay, mud
ninant, som
nd submery
tion present | | y
iot | All n
both
mat;
vege | All mud or clay or sand
bottom; little or no root
mat; no submerged
vegetation. | | | id
t | Hard-pan clay or
bedrock; no root mat or
vegetation. | | | | or | | |
| SCORE | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 3.
Pool variability | Ever
shall
sma
deer | low, la
low, la
li-shall
pools | f larg
rge-d
low, s | eep,
mail-
ent. | | Majority of pools large-
deep; very few shallow. | | | | | Shallow pools much
more prevalent than
deep pools. | | | | | Majority of pools small-
shallow or pools absent. | | | | | | |
| SCORE | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 4.
Sediment
deposition | Little or no enlargement
of islands or point bars
and less than 20% of the
bottom affected by
sediment deposition. | | | nt
s
the | Some new increase in
bar formation, mostly
from gravel, sand or fine
sediment; 20-50% of the
bottom affected; slight
deposition in pools. | | | | Moderate deposition of
new gravel, sand or fine
sediment on old and
new bars; 50-80% of the
bottom affected;
sediment deposits at
cotstructions,
constructions,
constructions and bends;
moderate deposition in
cools prevalent | | | | | Heavy deposits of fine
material, increased bar
development; more than
80% of the bottom
changing frequently;
pools almost absent due
to substantial sediment
deposition. | | | | | | | | |
| SCORE | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 5.
Channel flow
status | Wat
both
mini
char
expc | er read
lower
mai an
nnel su
osed | ches l
bank
nount
ibstra | base o
s, and
of
te is | f
i | Wat
avail
<25 ¹
subs | er fills
lable c
% of c
strate | >75%
hanne
hanne
is exp | i of th
it or
i
osed. | e | Wat
avai
and
are | er fills
lable o
lor riff
mostly | 25-7
chann
le sub
r expo | 5% of
el,
strate
ised. | the
s | Very little water in
channel and mostly
present as standing
pools. | | | | | | |
| SCORE | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| O O O I L | 20 19 18 17 16
Channelization or
dredging absent or
minimal, stream with
normal pattern. | | | Some channelization
present, usually in areas
of bridge abutments;
evidence of past
channelization, i.e.
dredging (greater than
20 yr) may be present,
but recent;
channelization is not | | | | Channelization may be
extensive; embankments
or shoring structures
present on both banks;
and 40 to 80% of stream
reach channelized and
disrupted. | | | | | Banks shored with
gabion or cement; over
80% of the stream reach
channelized and
disrupted. Instream
habitat greatly altered or
removed entirely. | | | | | | | | | |
| 6.
Channel
alteration | dred
mini
nom | mat, si
nal pat | tream
tem. | with | | evidi
char
dred
20 y
but r
char | ence o
ineliza
Iging (
r) maj
recent
ineliza | of past
ation, i
greate
y be p
t
ation is | e.
er thar
resent | 1
L | pres
and
read
dism | ent o
40 to
h cha
upted. | n both
80%
nneliz | i bank
of stre
jed an | s;
karn
d | chi
dis
hai
ren | annei
rupte
bitat (
nove | ized
ed. Ir
great
d ent | and
Istrei
Iy alt
irely. | am
ered | or | |

Continued over

AUSRIVAS Physical and Chemical Assessment Protocol Field Oata Sheets Page 11 Site No. $\underline{\neg \forall A}$ Date $\underline{\neg 2i \cdot \bigcirc ? \cdot ! ?}$

USEPA Habitat Assessment LOW GRADIENT STREAMS Page 2 of 2

Circle a score for each parameter

Condition category Habitat parameter Excellent Good Fair Poor The bends in the stream The bends in the stream: The bends in the stream Channel straight 7. increase the stream 1 to increase the stream acreese the stream water way has been Channel Englis 3 to 4 times endin 2 to 3 times 2 times longer than 강값. channelized for a long sinuosity kender than it it was in a ançar than tí ri was in al ×as nastraidh ire distance straght Sne straight fine, iNotechannel braiding is considered normal in ccastal plans and other low-lying areas. This parameter is not easy rated in Stesse areas). SCORE 20 19 18 17 16 15 14 13 12 11 10 9 5 4 3 2 1 0 137 6 8. Barks stable, evidence .Vederately stable; Moderately unstable: SD-Unstable; many erroled of ecosion or bank failure तरकरणका, आगव संस्कृ 90% of bank in reachares; ray area Barik stability at sent or morinal, life of erosion mostly heated has areas of eracion; frequent along straight. (score each bank) polential for future over, 5-30% of bank in hon ension potential sectors and bends; problems, 15% of bank chvicus bank stoughing; reach has areas of during hoods. 90-100% of pank has affected. ercsion. erosiona scars. SCORE 10 6 6 5 4 3 2 1 Э Leitark э 7 SCORE 10 9 (8) 6 2 3 Right bank 7 5 4 3 1 70-90% of the 50-70% of the Less than 50% of the More than 90% of the 9. streambark surfaces streambank surfaces streenbank surfaces streambank surfaces Vegetative and immediate riparian COMPTED BY Fastive covered by vegetation, covered by vegetation protection zone covered by netwe regetation, but one class esoption devices; disruption of streambark (score each bank) patches of bara soci or vegelation is very high: vegetation, including of parts is not wesbees understovey represented; cisruption vegetation has been desety proposed strubs, or non woody evident but not affecting vegetation contanton; fess removed to 5 macrophyles; vegelative hut plant growth polentiat than one-had of the centimetres or less in polenkal plant stubble zverage stubble height. disner ion through lo any great excart; greang or moving more than one had of height remaining. mainal or not exident. the potential plant. atmost all plants asseed statute height In grow naturally. re nairing SCORE (5) 1 Ð Lefttark 10 9 \$ 7 6 4 3 2 SCORE {ş) Right bank 10 9 8 7 6 4 3 2 1 3 Width of ripartan zone 10. With of riperan core 6 Wight of riparan zone With a riparian zone >18 metres; human 12-18 metres; human 12 metres; huttan <6 metres; little or no Riparian zone activities file, reads. activities have impacted activities have impacted ripertan vecelation is score pieseri bečause oli levers, crops etc.) hese the riparian zone only line ripartan zone a greak (score each bask) not, impacted the riparian minimally. deal human activities. 20196 SCORE Leftbark 10 9 6 [2] ٥ -B 7 5 4 3 1 SCORE **(**3) Föght bark 10 9 5 7 6 5 4 2 t D

TOTAL LOW GRADIENT HABITAT SCORE



AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 12

Site No.

4A

Date 21.09.17,

Channel cross-sections and variables to be measured in the area around a cross section

Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at homogeneous sampling sites (generally lowland streams) and three cross-sections at heterogeneous sampling sites (generally upland streams). Where the water level at the time of sampling is at or near the water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

| | Cross-section sketch | | Cros | s-section number /_ of _ / |
|---|--|---|---------------------------|---|
| | Dank wind | creek hed in flad. | Type of | f bedform at the cross-section
e □ Run □ Pool □Cascade ☑ Other <u>Dry</u> . |
| Bank height (m)
average - 32 | The channel sketch should show in cross
the water surface, watermark and bankful
outcrops and snags encountered at the c | section the shape of the channel and include the location of
lipoints. Also show other features such as bars, rocky
ross section. | Stream | Bankfull channel width (m)
(=total of boxes A+B+C)
am width at the water mark (m) |
| Bank
width (m) | Horizontal dis | tances (m) | | Bank
width (m) |
| Vertical distance
between the water
surface and the
water mark (m) | | compared and a c | | Vertical distance
between the water
surface and the
water mark (m) |
| | | Notes on cross-section measu | rement | |
| Riparian zone width
Left bank <u>4</u> (m) F | Right bank (m) | | | |
| Bank material Assess | % composition for each bank
Left bank Right bank | Substrate composition
Assess % composition in the area of bed 5m e
the cross-section. | ther side of | Vrg Assess in the area 5m either side of the cross section Filamentous algae cover 10–35% Solution 35-65% 65-90% >90% |
| Bedrock
Boulder (>256mm)
Cobble (64-256mm) | 51. 51. | Bedrock
Boulder (>256mm)
Cobble (64-256mm) | <u>51.</u> | Periphyton cover |
| Pebble (16-64mm)
Gravel (2-16mm)
Sand (0.06-2mm) | 10%. 10%.
10%. 10%. | Pebble (16-64mm)
Gravel (2-16mm)
Sand (0.06-2mm) | <u>01.</u>
<u>101.</u> | Moss cover
<pre>/<10%</pre> 10-35% 35-65% 65-90% |
| Fines (silt and clay, <0.06mn | 1) <u>351.</u>
Total 100% each | Fines (silt and clay <0.06mm) | <u>35:1.</u>) | Detritus cover |

Site No.

Channel cross-sections and variables to be measured in the area around a cross section

Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at homogeneous sampling sites (generally lowland streams) and three cross-sections at helerogeneous sampling sites (generally upland streams). Where the water level at the time of sampling is at or near the water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

| | Cross-section sketch | | Cros | s-section number | of |
|---|--|---|-------------------|--|---|
| | | | Type of
Riffle | bedform at the cross-section | ier |
| Bank height (m) | The charge sketch should show in cross
file water surface, watermark and bankful
outcrops and snags encountered at the p | section the shape of the channel and include the location of
I points. Also show other features such as bers, rocky
oss section | Strea
Stream | Bankfull channel width (m)
(=total of boxes A+B+C)
m width at the water mark (m)
width at the water surface (m) | Bank height (m) |
| Bank
width (m) | Horizontal dis | tances (m) | | | Bank
width (m) |
| Vertical distance
between the water
surface and the
water mark (m) | Ventical water | | | | Vertical distance
between the water
surface and the
water mark (m) |
| Riparian zone width | ight bank (m) | Notes on cross-section measu | rement | | |
| Bank material Assess | % composition for each bark
Left bank Right bank | Substrate composition
Assess % composition in the area of bed 5m a
the cross-section. | Rine: side of | Asses
Filamentous algae cover | is in the area 5m either side of the cross sections |
| Bedrock
Boulder (>256mm)
Cobb!e (64-256mm) | | Bedrock
Boulder (>256mm)
Cobble (64-256mm) |) _ | Periphyton cover <10% | 65-90% |
| Pebble (16-64mm)
Gravel (2-16mm)
Sand (0.06-2mm) | | Pebble (16-64mm)
Gravel (2-16mm)
Sand (0.06-2mm) | Total 100% | Moss cover
<pre> Moss cover 35-65% </pre> | 65-90% >90% |
| Fines (silt and clay, <0.06mm) | ;

Total 100% saon | Fines (silt and clay <0.06mm) |] | Detritus cover | 65-90% >90% |

_ Date ___

| AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 14 | |
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Date _____

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Channel cross-sections and variables to be measured in the area around a cross section

Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at homogeneous sampling sites (generally lowland streams) and three cross-sections at heterogeneous sampling sites (generally upland streams). Where the water level at the time of sampling is at or near the water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

| | Cross-section sketch | | Cros | s-section number | of | |
|--|---|---|-------------------|---|---|--|
| | | | Type of
Riffle | bedform at the cross-section | ner | |
| r:k height (m) | The channel sketch should show in pross-section the shape of the channel and include the location of the water surface, watermark and bankfull points. Also show other features such as bars, rocky otherps and snags encountered at the cross section. | | | Bankfull channel width (m)
(=total of boxes A+B+C) Bank height Stream width at the water mark (m) A Stream width at the water surface (m) Image: Comparison of the surface (m) | | |
| Bank
vidth (m) | Horizontal dis | tances (m) | | | Vertical distance
between the way
wurface and the
water mark (m | |
| liparian zone width | Yight back (m) | Notes on cross-section measu | rement | | Hater mark (m | |
| ant variat (III) The second sec | % composition for eact bank Leff bank | Substrate composition Assess % composition in the area of bed 5m e the cross-section. Bedrock Boulder (>256mm) Cobble (64-256mm) Pebble (16-64mm) Gravel (2-16mm) Sand (0.06-2mm) Fines (sitt and clay <0.06mm) | ither side of | Asses
Filamentous algae cover
<pre> <10% 10-35% 35-65% Periphyton cover <10% 10-35% 35-65% Moss cover <10% 10-35% 35-65% Detritus cover </pre> | in the area 5m either side of the cross section 65-90% >90% 65-90% >90% 65-90% >90% | |

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| AUSRIVAS Physical Assessment Protocol Field Data Sheets | Page 1 | Site No. 5A. Date 21.09.17 |
|--|---|--|
| Date <u>21.09.17.</u> Site No. <u>5A.</u> Time _ | 1130 | Recorder's Name JS + LL |
| Weather $\underline{Fire} + \underline{Sunny}$ Rain in last week? Y [] N [\times]
Latitude: $\boxed{2731}$ $\boxed{21}$ Longitude: $\boxed{151}$ $\boxed{59}$ $\underbrace{48}$
GPS Name and Datum | Photograph numb
bed in high
Photo point 2 | pers and details those point I on beach,
flow/flood events
I in creek sed. |
| PLANFORM SKETCH OF SITE
Including bedform types, location of cross-sections, access points, landmarks and natural or artificial channel or
Left bank is facing downstream. | floodplain features. | LENGTH OF SAMPLING SITE Bankfull width |

Acknowledgments - The content and layout of these data sheets are derived from the sheets used in the River Habitat Audit Procedure (Anderson, 1993a), AUSRIVAS, the Index of Stream Condition (Ladson and White, 1999 and DNRE Victoria) and the River Habitat Survey (Raven et al., 1998).

Page 2 Site No. <u>SA.</u> Date <u>21.09.17</u>.

7

| BASIC WATER CHEMISTRY | Linita | Valley shape | Local impacts on streams | |
|--|--------------------|--|---|--|
| and. | Units | Choose one category only | Choose one or more categories and describe the detail of each | |
| l'emperature | °C | Steep valley | Sand or gravel mining Sewage effluent | |
| Conductivity | | V | Other mining | |
| Dissolved Oxygen | mg l ⁻¹ | Shallow valley | Road River improvement works | |
| Dissolved Oxygen Sat. | % | RR | Bridge / culvert / wharf Water extraction | |
| рН | | Broad valley | Ford / ramp Dredging | |
| Turbidity | | | Discharge pipe Grazing | |
| Total phosphorus | | | Forestry activities | |
| Total nitrogen | | | Sugar mill Recreation | |
| | | Symmetrical | Irrigation run-off or Other | |
| ALRALINIT | | floodplain | pipe outlet | |
| Amount of water | ml | | Description | |
| Amount of H ₂ SO ₄ | ml | floodplain | | |
| Alkalinity | mg l ⁻¹ | | | |
| | | (e) | Local landuse | |
| Floodplain width | | Average O (m) | Left Right | |
| Floodplain features | | | Native forest | |
| Choose one or more features when present | | | Native grassland (not grazed) | |
| Sampling site has no distinct floodplain Sc | | oll systems | Grazing (native or non-native pasture) | |
| Oxbows / billabongs | alor | ort, crescentic strips or patches formed
ing the inner bank of a stream meander | Exotic grassland (lawns etc., no grazing) | |
| meander, isolated by a shift in the stream | Splays | | Forestry Native [] [] Pine [] [] | |
| channel Sm
Remnant channels over
Formed during a previous hydrological regime. May be infilled with sediment Flo | | all alluvial fan formed where an | Cropped Rainfed [] [] Irrigated [] [] | |
| | | I deposits material on the floodplain | Urban residential | |
| | | odplain scours | | |
| Flood channels | clea | our noies formed by the concentrated
aring and digging action of flowing water | | |
| floodplain and off the floodplain during | No. | floodplain features present | | |
| floods | Flo | odplain present at the sampling site but | | |
| | doe | es not contain any of the above features | | |
| | | | | |



Overall vegetation disturbance rating

Choose one category only. Sites with valley vegetation cleared on BOTH sides, but with riparian vegetation in good condition should be scored in the high disturbance category. Words within the drawings summarise the detailed text about the state of the riparian and valley vegetation for each category.







Channel shape Choose one category only



| Bank shape
Choose one category for each bank
Left Right | Bank slope
Choose one category for each bank
Left Right | Sediment oils Dry
Mabsent I light I moderate profuse |
|--|---|--|
| Concave | Vertical
80 - 90° | Water oils |
| | Steep
60 - 80° | Sediment odours |
| Stepped | Moderate
30 - 60° | anaerobic other |
| Wide lower bench | Low
10 - 30° | normal/none sewage petroleum chemical |
| | Flat
<10° | Turbidity (visual assessment) |
| Factors affecting bank stability Choose one or more categories None Cleared vegetation Mining Irrigation | Bedrock outcrops
Assess % of each bank covered by bedrock outcrops
% bedrock outcrops Left bank <u>``</u>
Right Bank <u>``</u> | s Is water clarity reduced by:
Suspended material
(e.g mud, clay, organics) Dissolved materia
(e.g plant leachates)
Water level at the time of sampling
Dry No flow Low Baseflow or near base |
| Runoff draw-down Stock Reservoir access releases | Artificial bank protection measures
Choose one or more categories | High Flood (don't sample) Artificial features at the sampling site |
| Human Seepage | Fence structures Levee banks Watering points Vegetation plantings | Choose one or more categories |
| or bridge waves | Rock or wall layer Logs strapped Rip rap to bank | Description |
| | | |

is measured in the office

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Page 6
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Site No.
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Date

Extent of bedform features Macrophyte cover Assess % cover of the sampling site by each category. Total % composition for all features must equal 100% Overall % cover of macrophytes % cover of emergent macrophytes Height >1m Waterfall % of site * Vea. within creak bed % cover of floating macrophytes Gradient >60° Est. Av. Length (m) Not aquatic species (macrophi Est. Av. Height (m) % cover of submerged macrophytes Est. Av. Gradient (°) le casuasinois, buitana Macrophyte composition % of site Step Height <1m Cascade Gradient 5-60° Est. Av. Length (m) Use a macrophyte field guide (i.e. Sainty and Jacobs, 1994) to aid identification. Strong currents Est. Av. Height (m) Listed macrophytes can be changed to reflect the common taxa present in each State or Territory. Est. Av/Gradient (°) N denotes a native taxa and I denotes an introduced taxa. Gradient 3-5° Rapid % of site Emergent macrophytes Submerged macrophytes Strong currents % Est Av. Length (m) Rocks break Present cover Present cover surface Est. Av. Depth (m) Brachiaria (Para Grass) | Ceratophyllum (Hornwort) N Est. Av. Width (m) Chara (Stonewart) N Crassula (Crassula) N Riffle Gradient 1-3° % of site Cyperus (Sedge) I/N Elodea (Canadian Pondweed) Moderate currents Est. Av. Length (m) Surface unbroken Eleocharis (Spikerush) N Myriophyllum (Water Milfeil) I/N Est. Av. Depth (m) but unsmooth Est. Av. Width (m) Nitella (Stonewart) N Juncus (Rush) I/N Potamogeton (Pondweed) N Glide Paspalum (Water Couch) N Gradient 1-3° % of site Small currents Est. Av. Length (m) Triglochin (Water Ribbon) N Phragmites (Common Reed) N Surface unbroken Est. Av. Depth (m) and smooth Vallisneria (Ribbonweed) N Ranunculus (Buttercup) | Est. Av. Width (m) Scirpus (Clubrush) N Other Run Gradient 1-3° % of site Triglochin (Water Ribbon) N Other Small but distinct Est. Av. Length (m) & uniform current Typha (Cumbungi) N Other Surface unbroken Est. Av. Depth (m) Other Est. Av. Width (m) Floating macrophytes Other Pool Present Area where % of site stream widens or Other Azolla (Azolla) N Est. Av. Length (m) deepens and Est. Av. Depth (m) current declines Callitriche (Starwart) | Est. Av. Width (m) Other Backwater % of site Other A reasonable sized (>20% of channel Est. Av. Length (m) Other width) cut-off Est. Av. Depth (m) section away from Overall % cover of native macrophyte taxa Est. Av. Width (m) Total should equal overall % cover of macrophytes from above Overall % cover of native macrophyte taxa Note: An additional response variable planform channel pattern

Total should equal overall % cover of macrophytes

Tightly packed, armoured

overlapping, tightly packed and

Array of sediment sizes,

Packed, unarmoured

Low compaction (2)

Loose array of fine sediments,

no overlapping, no packing and

structure and can be dislodged

very hard to dislodge

Bed compaction

00

Choose one category only

Page 7

Sediment angularity

Choose one category only Assess cobble, pebble and gravel fractions only

Site No. 52 Date 21.09.17



In the USEPA Habitat Assessment on the following pages, be sure to use the correct form for high or low gradient streams



Bed stability rating Choose one category only

very easily

| Array of sediment sizes,
overlapping, tightly packed but
can be dislodged with moderate | 8.58 | 0-5% fine sediment, high
availability of interstitial spaces |
|---|------|--|
| Moderate compaction
Array of sediment sizes, little
overlapping, some packing but
can be dislodged with moderate | | Matrix filled contact
framework
5-32% fine sediment, moderate
availability of interstitial spaces |
| Low compaction (1)
Limited range of sediment
sizes, little overlapping, some
packing and structure but can
be dislodged very easily | | Framework dilated
32-60% fine sediment, low
availability of interstitial spaces |
| 100 Contract (100 Contract) | | |

Sediment matrix

020,20

Choose one category only

Bedrock

Open framework



Matrix dominated >60% fine sediment, interstitial spaces virtually absent

- Stable

Unstable - eroding

Unstable - depositing

| Severe erosion | Moderate erosion | Bed stable | Moderate deposition | Severe deposition |
|---|---|---|--|---|
| Streambed scoured of fine
sediments. Signs of channel
deepening. Bare, severely eroded
banks. Erosion heads. Steep
streambed caused by erosion. | Little fine sediment present. Signs
of channel deepening. Eroded
banks. Streambed deep and
narrow. Steep streambed
comprised of unconsolidated
(loosely arranged and unpacked)
material | A range of sediment sizes present in
the streambed. Channel is in a
'relatively natural' state (not
deepened or infilled). Bed and bar
sediments are roughly the same
size. Banks stable. Streambed
comprised of consolidated | Moderate build-up of fine sediments
at obstructions and bars.
Streambed flat and uniform.
Channel wide and shallow. | Extensive build up of fine sediments
to form a flat bed. Channel blocked,
but wide and shallow. Bars large
and covering most of the bed or
banks. Streambed comprised of
unconsolidated (loosely arranged
and unpacked) material. |
| | | (tightly arranged and packed)
material. | | |
AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 8 Site No. _____ Date _____

USEPA Habitat Assessment Circle a score for each parameter

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HIGH GRADIENT STREAMS

Page 1 of 2

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AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 9 Site No. 🔜 Date

USEPA Habitat Assessment Circle a score for each parameter

Habitat

SCORE

SCORE

SCORE

5.

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7.

parameter

HIGH GRADIENT STREAMS

Condition calegory Excellent Good Fait Poor Occurrance of miles Courrance of affest Cossional rifle or bend; Generally all fat water or reatively frequent, ratio infrequent, distance bettom contours provide shatos attes poor Frequency of hebitat ofslance of distance between between rifes divided some habital; distance riffles (or bends) offies divided by with of by the width of the between milles divided between riffles divided ;ine stilearn <7∶1 stream is between 7 to by the witch of the by the wich of the (generally 5 to 7); variety 15 stream is between 15 to stream is a ratio of >25 of habital is sev. In 25. streems where rifles are continuous, piacament of basiders or other larce, natural distruction is important. 20 19 16 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 Banks stable; evidence Moverzieły statie: Moderately unstable; 30-Unstable; many evoded 60% of bank in reach of erosion or bank failure infrequent, small areas 37685; '324' 37836 Bank stability absent or minimal; little of erosion mostly neared has areas of erosidar(bequent along straight (store each band) potential for future over, 5-30% of bank in high grosten potential sections and bends: rovious bank skoghing: problems. <5% clibark reach has areas of during flaces. atiected ension 60-100% of bank has ercsional scars. Left Sark 10 9 З 2 1 Б 5 4 7 6 Right bank 10 9 Ĥ 7 6 5 4 з 2 1 Vore than 30% of the 73.90% of the 56-79% of the Cess than 50% of the streambank surfaces streambank surfaces streambank surfaces streamcent surfaces Vegetative and immediate riparian covered by native covered by vestation; covered by vegetation; protection zone povered by nalive disruccion of streambark vegetation, but one class distantian dizenus: score each band regelation, including of plants is not wellpatches of bare soil or vegetation is very leght. trees, understorey represented; discuption closely cooped vegetation has been STILLS OF NOT WOODY enders but not affecting vecetation common; less removed to 5 macrophytes; vegetaive full plant growth potential tan me hai dite centametres or less st distanción trough lo any greatestert potential plant shubble

average slubble height. grazing or moving more than one half of neght remarking. minimal or not evident; the potential plant amos: ai plants aboved stubble height prinemen to growine unally. SCORE jeft bærk 10 9 B 7 6 5 4 3 2 1 ¢ SCORE Right bank 10 9 Ĥ 7 6 5 4 3 2 1 0 10. Width of rightian zone With of sparanizone With or reparted zone 6-Width of reperien zone >18 meres huran 12-18 metres: human 12 metres; human <6 metres; 25e princi Riparian zone activities have impacted activities (i.e. matis, activities have impacted reparian vegetation is score lawns, crops etc.) have the riparian zone only the riparian some a great present because of s:ore each band not impacted the roadian minimary. desi human activities. 2009. SCORE 10 9 7 5 з Ð left bank 6 2 1 Ê 4 SCORE Right bank 10 9 B 7 6 5 4 3 2 1 ₽

TOTAL HIGH GRADIENT HABITAT SCORE



Page 2 of 2

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AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 10 Site No. <u>5A</u> Date <u>21.09.0</u>

| Habitat | | | | | | | | 0 | Cond | ition | cate | gor | 1 | | | | | | | | |
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| parameter | | Ex | celle | nt | 1 | | G | 2000 | 1 | | | - | Fair | 1 | | | | Po | or | | |
| 1.
Epifaunal
substrate /
available cover | Greater than 50% of
substrate favourable for
epifaunal colonisation
and fish cover; mix of
snags, submerged logs,
undercut banks, coble
or other stable habitat
and at stage to allow full
colonisation potential
(i.e. logs/snags that are
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ull
re | 30-50% mix of stable
habitat; well-suited for
full colonisation
potential; adequate
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of additional substrate in
the form of newfall, but
not yet prepared for
colonisation (may rate at
high end of scale). | | | 10-30% mix of stable
habitat; habitat
availability less than
desirable; substrate
frequently disturbed or
removed. | | | Less than 10% stable
habitat, lack of habitat is
obvious; substrate
unstable or lacking. | | | | | | | | | | |
| SCORE | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
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| SCORE | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
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| 5 | Water reaches base of
both lower banks, and
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channel substrate is | | af
1 | Water fills >75% of the
available channel; or
<25% of channel
substrate is exposed. | | | Water fills 25-75% of the
available channel,
and/or riffle substrates
are mostly exposed. | | | the | Very fittle water in
channel and mostly
present as standing
pools. | | | | | | | | | | |
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AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 11 Date

Site No.

USEPA Habitat Assessment Circle a score for each parameter

LOW GRADIENT STREAMS

Page 2 of 2

Habitat Condition category parameter Excellent Poor Good Fair The bends in the stream The bends in the stream The bends in the stream Channel straight: 7. Channel increase the stream increase the stream increase the stream 1 to waterway has been length 3 to 4 times length 2 to 3 times channelized for a long 2 times longer than if it sinuosity longer than if it was in a longer than if it was in a was in a straight line. distance straight line. (Note straight line. channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas). SCORE 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 Banks stable: evidence Moderately stable: Moderately unstable: 30-Unstable; many eroded 8 of erosion or bank failure infrequent, small areas 60% of bank in reach areas; 'raw' areas Bank stability frequent along straight absent or minimal; little of erosion mostly healed has areas of erosion; (score each bank) potential for future over. 5-30% of bank in high erosion potential sections and bends: obvious bank sloughing, problems. <5% of bank reach has areas of during floods. affected. erosion. 60-100% of bank has erosional scars. SCORE V Left bank 10 9 8 6 5 4 3 2 1 0 SCORE 0 0 Right bank 10 9 8 6 5 4 3 2 1 Less than 50% of the 9. More than 90% of the 70-90% of the 50-70% of the streambank surfaces streambank surfaces streambank surfaces streambank surfaces Vegetative and immediate riparian covered by native covered by vegetation; covered by vegetation. protection zone covered by native vegetation, but one class disruption obvious; disruption of streambank (score each bank) vegetation is very high; of plants is not wellpatches of bare soil or vegetation, including vegetation has been represented; disruption trees, understorey closely cropped shrubs, or non woody evident but not affecting vegetation common; less removed to 5 full plant growth potential than one-half of the centimetres or less in macrophytes; vegetative disruption through to any great extent; potential plant stubble average stubble height. more than one half of height remaining. grazing or mowing minimal or not evident; the potential plant almost all plants allowed stubble height to grow naturally. remaining. SCORE 2 10 9 5 4 3 1 0 Left bank 8 7 6 SCORE 3 Right bank 10 9 8 7 6 5 4 2 1 0 Width of riparian zone Width of riparian zone 10. Width of riparian zone Width of riparian zone 6->18 metres; human 12-18 metres; human 12 metres; human <6 metres; little or no Riparian zone activities (i.e. roads. activities have impacted activities have impacted riparian vegetation is score the riparian zone only present because of lawns, crops etc.) have the riparian zone a great (score each bank) not impacted the riparian minimally. deal. human activities. 700e SCORE 10 9 2 0 Left bank 8 7 6 5 4 3 1 SCORE 4 Right bank 10 9 8 7 6 5 3 2 1 0

TOTAL LOW GRADIENT HABITAT SCORE



CN



Channel cross-sections and variables to be measured in the area around a cross section

Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at homogeneous sampling sites (generally lowland streams) and three cross-sections at heterogeneous sampling sites (generally upland streams). Where the water level at the time of sampling is at or near the water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

| | Cross-section sketch | bankyt | Cre | oss-section number $\underline{}$ of $\underline{}$ | - |
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| Bank height (m) | from Da | for | creat bed . S | tream width at the water mark (m) | eight (n |
| | The channel sketch should show in cross
the water surface, watermark and bankfu
outcrops and snags encountered at the c | s-section the shape of the channel and includ
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Bank material Asses
Bedrock
Boulder (>256mm)
Cobble (64-256mm)
Pebble (16-64mm)
Gravel (2-16mm) | Right bank 7 (m)
s % composition for each bank
Left bank Right bank
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Substrate composition
Assess % composition in the area
the cross-section.
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Boulder (>256mm)
Cobble (64-256mm)
Pebble (16-64mm)
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Riparian zone width
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Bank material Asses
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Boulder (>256mm)
Cobble (64-256mm)
Pebble (16-64mm)
Gravel (2-16mm)
Sand (0.06-2mm) | Right bank 7 (m)
s % composition for each bank
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Substrate composition
Assess % composition in the area
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Pebble (16-64mm)
Gravel (2-16mm)
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| water mark (m) Riparian zone width Left bank <u>3</u> (m) Bank material Asses Bedrock Boulder (>256mm) Cobble (64-256mm) Pebble (16-64mm) Gravel (2-16mm) Sand (0.06-2mm) Fines (silt and clay, <0.06mm) | Right bank 2 (m)
s % composition for each bank
Left bank Right bank
$\frac{0}{5}$ $\frac{0}{5}$
$\frac{40}{5}$ $\frac{0}{5}$
$\frac{40}{5}$ $\frac{0}{5}$
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$\frac{5}{5}$ $\frac{5}{5}$ | Notes on cross-section
Substrate composition
Assess % composition in the area
the cross-section.
Bedrock
Boulder (>256mm)
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| Abolymas Filiyaical and onemical Assessment Flotocol field Data Sheets Fage 19 | रIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 13 |
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Site No.

Date

Channel cross-sections and variables to be measured in the area around a cross section

Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at homogeneous sampling sites (generally lowland streams) and three cross-sections at heterogeneous sampling sites (generally upland streams). Where the water level at the time of sampling is at on near the water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

| | Cross-section sketch | | Cros | s-section number | of |
|---|--|---|--------------|---|---|
| | | | Type of | bedform at the cross-section | er |
| Bank height (m) | The charteel sketch should show in cross
the water surface, watermark and bandud
exterops and snags encountered at the p | section the shape of the thannel and include the location of
Localis. Also show other features such as bars, rocky
assisection. | Strea | Bankfull channel width (m)
(=total of boxes A+B+C)
um width at the water mark (m)
width at the water surface (m) | Bank height (m) |
| Bank width (m) | Horizontal dis | | | | Bark
width (m) |
| Vertical distance
between the water
surface and the
water mark (m) | Vertical water | depihs (cm) | | | Vertical distance
between the water
surface and the
water mark (m) |
| Riparian zone width
Left bank (m) R | icht bank (m) | Notes on cross-section measur | rement | | |
| Bank material Assess | % composition for each bank
Left bank Right bank | Substrate composition
Assess % composition in the area of bed 5 m ei-
the cross-section. | ther side of | Asses
Filamentous algae cover | s in the area 5m either side of
the cross section
65-90% >90% |
| Bedrock | | Bedrock | ì | | |
| Boulder (>256mm) | | Boulder (>256mm) | i | Periphyton cover | |
| Cobble (64-256mm) | | Cobble (64-256mm) | % | <10% 10–35% 35-65% | 65-90% >90% |
| Pebble (16-64mm) | | Pebble (16-64mm) | }§ | Moss cover | |
| Gravel (2-16mm) | | Gravel (2-16mm) | | | 65-90% >90% |
| Sand (0.06-2mm) | | Sand (0.08-2mm) | | | |
| Fines (silt and day, <0.06mm) | | Fines (silt and day <3.06mm) |] | Detritus cover | |
| | Total 100% each | | | <10% 10–35% 35-65% | 65-90% >90% |

| AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 14 |
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Channel cross-sections and variables to be measured in the area around a cross section

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Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at homogeneous sampling sites (generally lowland streams) and three cross-sections at heterogeneous sampling sites (generally upland streams). Where the water level at the time of sampling is at or near the water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

| | Cross-section sketch | | Cros | s-section number | of |
|---|---|---|-----------------|--|---|
| | | | Type of | bedform at the cross-section | |
| ank height (m) | The channel sketch should show in criss
the water surface, watermark and bandh
outcops and snags encountered at the c | -section, the shape of the channel and include the location of
I points. Also show other features such as bars, tooky
ross section. | Strea
Stream | Bankfull channel width (m)
(=total of boxes A+B+C)
am width at the water mark (m)
width at the water surface (m) | Barik height |
| Bank
width (m) B
Vertical distance
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surface and the
water mark (m) | Horizontal dis | lances (m) | | | Vertical distance
between the was
water mark (m) |
| Riparian zone width | | Notes on cross-section measurem | nent | | |
| Left bank (m) F
Bank material Assess
Bedrock
Boulder (>256mm)
Cobble (64-256mm) | light bank (m)
% composition for each bank
Left bank Right bank
 | Substrate composition
Assess % composition in the area of bed 5m either
the cross-section.
Bedrock
Boulder (>256mm)
Cobble (\$4-256mm) | side of | Assess in
Filamentous algae cover
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the cross section
65-90% >90%
65-90% >90% |

| AUSRIVAS Physical Assessment Protocol Field Data Sheets | Page 1 Site No. <u>8A</u> Date <u>21.09.17</u> |
|---|--|
| Date 21.09.17 Site No. <u>8A</u> Time <u>14</u>
River Name <u>Location</u> <u>With</u> | Recorder's Name <u>35 + 22</u> |
| Weather Kine Sunny. Rain in last week? Y [] N [X] P Latitude: deg min sec deg deg min sec deg d | hotograph numbers and details refer \mathcal{U} phone $\mathcal{U}_{\mathcal{F},\mathcal{S},\mathcal{W}}$ |
| PLANFORM SKETCH OF SITE
Including bedform types, location of cross-sections, access points, landmarks and natural or artificial channel or floodp
Left bank is facing downstream. | LENGTH OF SAMPLING SITE Bankfull width x 10 Length of sampling site Notes Koala Scat Gch?dna Scat Gch?dna Scat BEFORE LEAVING THE SITE, CHECK DATA SHEETS TO ENSURE THAT ALL VARIABLES |

Acknowledgments - The content and layout of these data sheets are derived from the sheets used in the River Habitat Audit Procedure (Anderson, 1993a), AUSRIVAS, the Index of Stream Condition (Ladson and White, 1999 and DNRE Victoria) and the River Habitat Survey (Raven et al., 1998).

| Page | 2 |
|------|---|
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| | nits Choose one category only | Local impacts on streams
Choose one or more categories and describe the detail of each |
|--|--|---|
| Temperature | Steep valley | Sand or gravel mining Sewage effluent |
| Dissolved Oxygen | ng l ⁻¹ Shallow valley | Road River improvement works Water extraction |
| pH
Turbidity | Broad valley | Ford / ramp Grazing Grazing |
| Total phosphorus | Gorge | Forestry activities Recreation 1 |
| ALKALINITY | Symmetrical floodplain | Sugar mill Irrigation run-off or pipe outlet |
| Amount of H ₂ SO ₄ | Asymmetrical floodplain | Description traces + metal sheeting along
width of creek at tence crossings |
| Floodplain width | Average ~ <u>100</u> (m) | Local landuse
Choose one category for each bank
Left Right
Native forest |
| Shoose one or more features when present Sampling site has no distinct floodplain Oxbows / billabongs Body of water occupying a former river meander, isolated by a shift in the stream channel | Scroll systems
Short, crescentic strips or patches formed
along the inner bank of a stream meander
Splays
Small alluvial fan formed where an | Native grassland (not grazed) Grazing (native or non-native pasture) Exotic grassland (lawns etc., no grazing) Forestry Native [][] Pine [][] Cropped Bainfed [][] Livianted [][] |
| Remnant channels Formed during a previous hydrological regime. May be infilled with sediment Flood channels A channel that distributes water onto the floodplain and off the floodplain during floods | overloaded stream breaks through a levee
and deposits material on the floodplain Floodplain scours
Scour holes formed by the concentrated
clearing and digging action of flowing water No floodplain features present
Floodplain present at the sampling site but
does not contain any of the above features | |

| AUSRIVAS Physical Assessment Protoc | col Field Data Sheets Pa | Page 3 Site No. <u>8A</u> Date <u>21-09-17</u> |
|---|---|--|
| Riparian zone composition Blue gun
Assess for whole sampling site
% Cover | domnakt Aladphin.
Vegetation Description | Longitudinal extent of riparian vegetation
Choose one category for each bank. Do not
include ground layer except where site is in
native grassland. |
| Trees (>10m in height)30% | 6 Blue Gun, E. crebra, C. tessebri | None |
| Trees (<10m in height) | | Isolated / scattered |
| Shrubs | To to Lantana. | Regularly spaced |
| Grasses / ferns / sedges 70 |) \$ Paoture grasses - gra | azed, Occasional clumps |
| Cheding of channel | 0 0 | Semi-continuous |
| Shading of channel < 5% | 51 – 75% > 76% | Continuous |
| Extent of trailing bank vegetation inil moderate | Native and exotic riparian vegetation
% Native | Regeneration of native woody vegetation
Is the sampling site in undisturbed forest?
Y [] N [<>] |
| X slight extensive | % Exotic <u>20%</u> | Abundant (>5% cover) and heat
regeneration
category Very limited (<1% cover) |

Overall vegetation disturbance rating

Choose one category only. Sites with valley vegetation cleared on BOTH sides, but with riparian vegetation in good condition should be scored in the high disturbance category. Words within the drawings summarise the detailed text about the state of the riparian and valley vegetation for each category.



Box

Wide box



Trapezoid

Site No. Date

Concrete V

Pipe or culvert



V shaped

| Choose one category for each bank
Left Right
bank bank | Bank slope
Choose one category for each bank
Left Right
bank bank | Sediment oils |
|---|---|--|
| Concave 🛛 🖾 | Vertical
80 - 90° | none flecks globs sheen slick |
| | Steep
60 - 80° · | Sediment odours |
| Stepped | Moderate
30 - 60° | anaerobic other |
| Wide lower bench | Low
10 - 30° | normal/none sewage petroleum chemical |
| | Flat
<10° | Turbidity (visual assessment) |
| Factors affecting bank stability
Choose one or more categories | Bedrock outcrops
Assess % of each bank covered by bedrock outcrops
% bedrock outcrops Left bank | Is water clarity reduced by:
Suspended material
(e.g mud, clay, organics)
Dissolved material
(e.g plant leachates) |
| Mining Vegetation | Right Bank 🔵 | Water level at the time of sampling |
| | Artificial bank protection measures | Dry No flow Low Baseflow or near base |
| Runoff Irrigation | Choose one or more categories | |
| Runoff Irrigation Stock Reservoir access releases | None Fenced stock | Artificial features at the sampling site |
| Willing Irrigation Runoff draw-down Stock Reservoir access releases Human Seepage | Choose one or more categories None Fence structures Fence structures | Artificial features at the sampling site
Choose one or more categories |
| Willing Irrigation Runoff Irrigation Stock Reservoir access releases Human Seepage Ford culvert Flow and | Choose one or more categories None Fenced stock watering points Fence structures Vegetation plantings | Artificial features at the sampling site
Choose one or more categories
Major Minor Ford Bridge Culvert Other
weir |
| Winning Irrigation Runoff Irrigation Stock Reservoir access Reservoir Human Seepage Ford, culvert Flow and or bridge Point | Choose one or more categories None Fenced stock watering points Fence structures Vegetation plantings Rock or wall layer Logs strapped | Artificial features at the sampling site
Choose one or more categories
Major Minor Ford Bridge Culvert Ot
weir
Description Fearce + model charting at bracks |
| Willing Irrigation Runoff Irrigation Stock Reservoir access Reservoir Human Seepage Ford, culvert Flow and or bridge waves Feral animals Drainpipes | Choose one or more categories None Fenced stock watering points Fence structures Vegetation plantings Rock or wall layer Logs strapped to bank Rip rap Concrete channel | Artificial features at the sampling site
Choose one or more categories
Major Minor Ford Bridge Culvert Ot
weir
Description Ferrer + model sharing at bracking
Major Culvert |

Page 6





Page 7

Site No. 8A Date 21-09.1

Sediment angularity Choose one category only Assess cobble, pebble and gravel fractions only



In the USEPA Habitat Assessment on the following pages, be sure to use the correct form for high or low gradient streams



Bed stability rating Choose one category only

Unstable - eroding

Unstable - depositing

| Severe erosion | Moderate erosion | Bed stable | Moderate deposition | Severe deposition |
|---|---|--|--|---|
| Streambed scoured of fine
sediments. Signs of channel
deepening. Bare, severely eroded
banks. Erosion heads. Steep
streambed caused by erosion. | Little fine sediment present. Signs
of channel deepening. Eroded
banks. Streambed deep and
narrow. Steep streambed
comprised of unconsolidated
(loosely arranged and unpacked)
material | A range of sediment sizes present in
the streambed. Channel is in a
'relatively natural' state (not
deepened or infilled). Bed and bar
sediments are roughly the same
size. Banks stable. Streambed
comprised of consolidated
(tightly arranged and packed)
material | Moderate build-up of fine sediments
at obstructions and bars.
Streambed flat and uniform.
Channel wide and shallow. | Extensive build up of fine sediments
to form a flat bed. Channel blocked,
but wide and shallow. Bars large
and covering most of the bed or
banks. Streambed comprised of
unconsolidated (loosely arranged
and unpacked) material. |

- Stable -



Bedrock

Sediment matrix

Choose one category only



C

5-32% fine sediment, moderate availability of interstitial spaces

Open framework

0-5% fine sediment, high

Matrix filled contact

availability of interstitial spaces

Framework dilated 32-60% fine sediment, low availability of interstitial spaces

 Matrix dominated

 >60% fine sediment, interstitial

 spaces virtually absent

AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 8 Site No. _____ Date _____

USEPA Habitat Assessment HIGH GRADIENT STREAMS Page 1 of 2 Circle a score for each parameter

Habitat Condition category parameter Excelent Good Fait Peor 1. Greater than 70% of 40-70% mix of stable 20-45% spin of stable Less than 20% stable Epifaunal s osuale favourable for hadda; well-suited for habilat habilar habitat; lack of habitat is ectaurial colorisation and ul comisation avariables iten stratus; substrate substrate / fish cover, mix of snags, potentiat, askep etc. desktable; substrate unstable or lecting. available cover submerged logs, underout habital for maintenance frequently disturbed or bandies, cooble or other of populations; presence removed. stable habitat and at slage of artificial substrate in in allow full polonisation. the form of newfail, but potential (.e. kos/snecs not yet precared for that are not new fact and ectomisation (may rate at not transient). Sighard of scale), SCORE 20 19 18 17 16 15 14 13 12 4 3 2 1 11:10 9 3 7 5 3 2. Gravel, cobble and Stavel, cobbe and Gravel, cooble and Sravel, cobble and boulder particles are 0-Embeddedness boulder particles are 25bouiler partcles are 50bouider particles are 25% surrounded by fire SC% surrounded by fine 75% sustained by fine more than 75% seconent, Lavering of sectiment seciment. surrounded by fine cobile provides diversity sediment. of niche space SCORE 20 19 18 17 16 15 14 13 12 11 10 3 8 7 5 4 3 2 1 D Daiy 3 of the 4 regimes 3. At four velocity design Crisy 2 of the 4 related Demnaled by 1 regimes present (slowpresent (if fast-shadow is regimes present [3 fastvelocity/deccir recime Velocity / depth deep slow-shallow, fast-TESSING SCORE 20WER shakew or slow-shakew [USUBLY SOM CHEE] regime ceep fast-station; Slow than if missing other are missing, score kw/ is <0 3m/s, deep is regimes). ×0.5m). SCORE 20 19 18 17 16 15 14 13 12 11 5 E DI 7 5 4 3 2 1 0 4. Utile or no envargement of Some new increase in Moderate decosition of Heavy decoses of fine new gravel, sand or fine istands or point bars and bar formation, messly material, increased bar Sediment less than 5% of the bottom from pravel, sand or fine sediment on de and development; more than deposition affected by sediment sedment; 5-30% of the new bars; 30-50% of the 50% of the bottom deposition oction affected slicht totan afadat changing frequently; sediment deposits at deposition in pools. pools almost absent due conctors. . Io substaniai sedicent constrictions and bends: deposition. moderale deposition in poots prevalent. SCORE 20 19 18 17 16 15 16 13 12 11 10 9 8 7 6 5 4 3 2 1 0 Water (\$5,25-75% ct the 5. Water reaches base of Water Rs >75% of the Very ittle water in both lower basies, and available channel; or a alaole channei, channel and mostly Channel flow යෝගයේ නොදැන්, ඒ <25% of charmel ລາຜົດ ເກີຍ ແຜ່ຮູ່ນສະຮ present as standing status charvel substrate is substrate is exposed are receive exposed. pools. epossi. SCORE 20 19 18 17 16 15 14 13 12 11 10 9 8 8 7 2 1 0 5 4 3 6 Б. Charmelization or Some than elization Changelization may be Banks shored with dredging absent or Channel present, usually in areas edensive, embankments gabion or cement, over minimal, stream with of bridge acutiments; or shoring structures 60% of the stream reach. alteration normal pattern. evidence of past. present on both parks; channelized and charreization, i.e. and 40 to 80% of stream dangled Instream stedging (greater than reach chennelized and habitat oreatly altered or 20 yr) may be present. distanted removed entirely. but recent charreization is not present, SCORE 20 19 18 17 16 15 14 13 12 11 10 5 8 7 5 4 3 2 6 1 | C

Continued over

AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 9 Site No. ______ Date _____

USEPA Habitat Assessment Circle a score for each parameter

ent HIGH GRADIENT STREAMS

Page 2 of 2

| Habitat | ĺ | | | | | C | an | dition | i cate | ÇD | Γÿ | | | | | | |
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TOTAL HIGH GRADIENT HABITAT SCORE



AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 10 Site No. 24 Date 21.09.17

USEPA Habitat Assessment

| Habitat | | | | | | | | 0 | ond | ition | cate | egoi | N. | | | | | | | _ | |
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| SCORE | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 2.
Pool substrate
characterization | Mixto
mate
and
root
subr
com | ure of
erials,
firm s
mats
nerge
mon. | subsi
with g
and p
and
d veg | trate
gravel
revale
etation | nt;
1 | Mixt
mud
be d
mate
vege | ure of
i or cla
iomina
s and
station | soft s
ay; mu
ant; so
subm
press | and,
id may
me ro
erged
ent. | ot | All n
both
mat,
vege | nud c
om; li
; no s
etatio | r clay
ttle or
ubme
n. | ror sa
no ro
rged | nd
ot | Ha
bec
veg | rd-pa
drock
getati | an cla
; no
ion, | y or
root n | nat o | or |
| SCORE | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 3.
Pool variability | Ever
shail
sma
deer | n mix
low, la
I-shai | of larg
arge-d
low, s
s pres | eep,
mail-
ent | | Majo
deep | ority d
p; very | f pools
few s | s large
shallou | E | Sha
mon
deej | llow p
e pre
p poo | valient
is. | much
than | - | Ma | jority
allow | of p
or po | ools s
ols a | mai | l-
nt. |
| SCORE | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 6 |
| 4.
Sediment
deposition | Little
of isl
and
botto
sedi | e or no
lands
less t
om att
ment | o eniar
or poi
han 2
lected
depos | geme
nt bar
0% of
by
ition. | nt
s
the | Som
bar f
from
sedi
bottx
depo | ie new
formal
n grave
ment;
om aff
osition | v incre
tion, m
el, san
20-50
ected
i in po | ase in
tostly
id or fi
1% of f
slight
ols. | ne
ihe
t | Mod
new
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obst
cons
mod
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tructi
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ferate
is pre | e depo
el, sa
on ol
; 50-8
fecte
depo
ons,
ons a
e depo
walen | nd or
d and
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d
sits al
sits al
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nds;
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terial
velop
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angin
ols al
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positi | depos
ment
the b
g fre
most
tantia
tantia | its of
ease
mor
ottom
quent
abse
i sed | fine
d ba
e th
ty;
nt d
men | r
an
ue
tt |
| SCORE | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 5.
Channel flow
status | Wat
both
mini
char
expc | er rea
lower
mai a
mei s
nei s | ches I
r bank
mount
ubstra | base (
is, and
of
ite is | of
1 | Wat
avai
<25
subs | er fills
lable o
% of o
strate | >759
channi
channi
is exp | 6 of th
el; or
el
osed. | e | Wat
avai
and
are | ter fill
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for nif
most | s 25-
chan
fle su
ly exp | 75% o
nel,
bstrati
osed. | f the
es | Ver
cha
pre
por | ry litt
annel
isent
ols. | le wa
and
as s | ter in
most
tandir | ly
1g | |
| SCORE | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 6.
Channel
alteration | Cha
dred
mini
nom | nneliz
Iging :
mal; s
nal pa | ation d
absen
tream
ttern, | or
t or
t with | 5 | Som
pres
of br
evid
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but r
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ient, u
ence i
nneliza
Iging (
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of str
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ment,
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ove
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or |
| SCORE | 20 | 10 | 12 | 17 | 16 | pres
15 | | 12 | 42 | | 10 | 0 | | 7 | 6 | 5 | | 1 | 2 | | L. |

Continued over

| AUSRIVAS Physical | and Chemical Assessment Protocol Field Data Sheets | Page 11 |
|-------------------|--|---------|
| Site No. | Date | |

-

USEPA Habitat Assessment

LOW GRADIENT STREAMS

Page 2 of 2

Circle a score for each parameter

| Habitat | | | | | C | onditio | n categ | ory | | | | | | |
|---|---|---|---|--|--|--|---|--|--|-----------------------|--|--|--|---|
| parameter | Exce | llent | 8 | | Good | | 1 | Fair | r | | | Po | noc | |
| 7.
Channel
sinuosity | The bends in
increase the s
length 3 to 4
longer than if
straight line. (
channel braid
considered n
coastal plains
low-lying area
parameter is
rated in these | the str
stream
times
it was
Note -
ing is
ormal it
and o
us. Thi
not eas
areas | in a
n
ther
sily
). | The ben
increase
length 2
longer th
straight | ds in the
the stre
to 3 tim
han if it w
line. | e stream
eam
es
vas in a | The be
increased
times
was in | inds in t
se the st
s longer
a straig | he stre
ream 1
than if
ht line. | am
1 to
it | Chann
waterw
channe
distanc | el stra
vay ha
elized
ce. | aight;
is beei
for a l | n
ong |
| SCORE | 20 19 1 | 8 17 | 16 | 15 14 | 1 13 | 12 11 | 10 9 | 8 | 7 | 6 | 5 4 | 3 | 2 | 1 0 |
| 8.
Bank stability
(score each bank) | Banks stable
of erosion or
absent or min
potential for fi
problems. <5
affected. | evide
bank fa
imal; li
uture
7% of b | nce
aiture
ittle
xank | Moderal
infreque
of erosic
over. 5-
reach ha
erosion. | ely stabl
nt, small
on mostly
30% of I
as areas | e;
I areas
y healed
bank in
of | Moder
60% o
has an
high e
during | ately uns
f bank in
eas of er
rosion po
floods. | stable,
reach
osion;
stentia | 30- | Unstat
areas;
freque
section
obviou
60-100
erosion | ole; m
'raw'
nt alor
ns and
s ban
96 of
nal sc | any er
areas
ng stra
i bend
k slou
bank l
ars. | oded
sight
ls;
ghing;
has |
| SCORE | Left bank | 10 | 9 | 8 | 7 | 6 | (5 | 4 | | 3 | 2 | | 1 | 0 |
| SCORE | Right bank | 10 | 9 | 8 | 7 | 6 | 5 | 4 | | 3 | 2 | | 1 | 0 |
| 9.
Vegetative
protection
(score each bank) | More than 90
streambank s
and immedial
zone covered
vegetation, in
trees, unders
shrubs, or no
macrophytes
disruption thr
grazing or mo
minimal or no
almost all plat
to grow natur | % of the
surface
e ripar
by nai
cluding
torey
n wood
veget
ough
wing
t evide
nts allo
ally. | ne
ss
ian
tive
}
dy
ative
nt;
wed | 70-90%
streamb
covered
vegetatio
of plants
represer
evident i
full plant
to any g
more the
the pote
stubble
(emaicin | of the
vank surf
by nativ
on, but o
s is not w
nted; diss
but not a
t growth
reat exte
an one h
nitial plar
height
19. | aces
e
ne class
vell-
ruption
ffecting
potential
nt;
alf of
t | 50-70
stream
covere
disrup
patche
closely
vegeta
than o
potenti
height | % of the
bank su
d by veg
tion obvir
s of bane
cropper
tion com
ne-half o
al plant
remainin | rfaces
jetatio
bus;
e soil c
d
mon;
f the
stubble
19 | n;
xr
less
e | Less fi
stream
covere
disrupt
vegeta
vegeta
removi
centim
averag | han 50
Ibank
d by 1
tion of
tion is
tion h
ed to 9
etres
je stut | D% of
surfac
vegeta
(strear
strear)
as bee
5
or less
bble he | the
xes
fior;
mbank
high;
an
s in
eight. |
| SCORE | Left bank | 10 | 9 | Ş | 7 | 6 | 5 | 4 | | 3 | 2 | | 1 | 0 |
| SCORE | Right bank | 10 | 9 | 3 | 7 | 6 | 5 | 4 | | 3 | 2 | | 1 | 0 |
| 10.
Riparian zone
score
(score each bank) | Width of ripa
>18 metres; I
activities (i.e.
lawns, crops
not impacted
zone | rian zo
numan
roads,
etc.) h
the rip | ne
ave
arian | Width of
12-18 m
activities
the ripar
minimal | f riparian
netres; hi
s have in
rian zone
ly. | i zone
uman
npacted
e only | Width
12 me
activiti
the rip
deal. | of riparia
tres; hun
es have
arian zor | an zon
nan
impac
ne a gr | e 6-
ted
reat | Width
<6 me
ripariar
presen
human | of ripe
tres; I
n vege
t beca
n activ | arian z
ittle or
etation
ause o
ities. | no
no
is
t |
| SCORE | Left bank | 10 | 9 | 8 | 7 | 6 | 5 | 4 | | 3 | 2 | 0 | D | 0 |
| SCORE | Right bank | 10 | 9 | 8 | 7 | 6 | 5 | 4 | | 3 | 2 | 10 | D | 0 |

TOTAL LOW GRADIENT HABITAT SCORE



| AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 12 | AUSRIVAS Physica | and Chemical | Assessment | Protocol Field | Data Sheets | Page 12 | |
|--|------------------|--------------|------------|----------------|--------------------|---------|--|
|--|------------------|--------------|------------|----------------|--------------------|---------|--|

Site No. 8A Date 2009, 07

Channel cross-sections and variables to be measured in the area around a cross section

Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at homogeneous sampling sites (generally lowland streams) and three cross-sections at heterogeneous sampling sites (generally upland streams). Where the water level at the time of sampling is at or near the water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

| | Cross-section sketch | | Cros | s-section number of |
|---|--|---|----------------|---|
| | | | Type of | bedform at the cross-section |
| | | | Riffle | Run Pool Cascade Other |
| | | | | Bankfull channel width (m) |
| Bank height (m) | | | | (=total of boxes A+B+C) Bank height (m) |
| $\overline{\boldsymbol{z}}$ | | | Strea | am width at the water mark (m) $\int S_{A}$ |
| | the channel sketch should show in cross
he water surface, watermark and bankfu
putcrops and snags encountered at the c | -section the shape of the channel and include the location of
II points. Also show other features such as bars, rocky
ross section. | Stream | width at the water surface (m) |
| Bank 2 B | Horizontal dis | tances (m) | | Bank
width (m) |
| Vertical distance | - processo | | | |
| between the water | | | | |
| bed surface and the water mark (m) | Vertical wate | r depths (cm) | | led surface and the |
| | | Notes on cross-section measured | urement | water mark (m) |
| Riparian zone width | | | | |
| Left bank (m) Ri | ght bank (m) | | | |
| Bank material Assess 9 | composition for each bank
Left bank Right bank | Substrate composition
Assess % composition in the area of bed 5m
the cross-section. | either side of | Assess in the area 5m either side of
the cross section |
| Bedrock | 00 | Bedrock _ | 0 | |
| Boulder (>256mm) | 00 | Boulder (>256mm) | 0 | Periphyton cover |
| Cobble (64-256mm) | 10 10 | Cobble (64-256mm) | 10 8 | <10% 10–35% 35-65% 65-90% >90% |
| Pebble (16-64mm) | 0 0 | Pebble (16-64mm) | 5 100 | Mass sover |
| Gravel (2-16mm) | 0 0 | Gravel (2-16mm) | | |
| Canalização | 0 10 | Sand (0.06-2mm) | Zasa | <10% 10-35% 35-65% 65-90% >90% |
| Sand (0.06-2mm) | | | C OT L | |
| Sand (0.06-2mm)
Fines (silt and clay, <0.06mm) | 80 80 | Fines (silt and clay <0.06mm) | THON . | Detritus cover |

| AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 13 |) |
|--|---|
|--|---|

Site No. ____ Date ___

Channel cross-sections and variables to be measured in the area around a cross section

Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at homogeneous sampling sites (generally lowland streams) and three cross-sections at heterogeneous sampling sites (generally upland streams). Where the water level at the time of sampling is at cross-mean (he water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

| | Cross-section sketch | | | s-section number | of |
|--|---|--|-------------------|--|---|
| | | | Type of
Riffle | bedform at the cross-section | er |
| Bank height (m) | The channel sketch should show in cross
the water surface, water mark and bandfu
eutorops and snags encountered at be p | section the shape of the channel and induce the location of
Ipoints. Also show other features such as bars, rocky
oss section. | Strea
Stream | Bankfull channel width (m)
(=total of boxes A+B+C)
m width at the water mark (m)
width at the water surface (m) | Bank height (m |
| Bank
width (m) | Horizontal dis | ances (m) | | | Vertical distance
between the water
surface and the |
| Riparian zone width | Right bank (m) | Notes on cross-section measur | ement | | |
| Bank material Assess | % composition for each bank
Left bank Right bank | Substrate composition
Assess % composition in the area of bed 5m eith
the cross-section. | her side of | Asses
Filamentous algae cover | s in the area 5m either side of
the cross section
65-90% >90% |
| Bedrock
Boulder (>256mm)
Cobble (64-256mm)
Pebble (16-64mm)
Gravel (2-16mm)
Sand (0.06 2mm) | | Bedrock | Total 100% | Periphyton cover <10% | 65-90% >90% |
| Fines (silt and day, <0.06mm |)
Total 100% each | Sand (0.06-2mm)
Fines (silt and day <0.06mm) |] | Detritus cover |
 |

| AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 14 | |
|--|--|
|--|--|

Channel cross-sections and variables to be measured in the area around a cross section

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Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at homogeneous sampling sites (generally lowland streams) and three cross-sections at helerogeneous sampling sites (generally upland streams). Where the water level at the time of sampling is at or near the water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

| | Cross-section sketch | | Cros | s-section number | of |
|------------------------------|--|--|-------------------------|----------------------------------|--|
| | - | | Type of
Riffle | bedform at the cross-section | er |
| | | | | (=total of boxes A+B+C) | |
| nk height (m) | | | Strea | m width at the water mark (m) | Bank height |
| | The channe, sketch should show in cross
the water surface, watermark and bankfu
our crops and snags encountered at the p | section the shape of the channel and include the location of
I points. Also show other leatures such as bers, rocky
oss section. | Stream | width at the water surface (m) | |
| Bank
vidth (m) | Horizontal dis | | | | Bank
width (|
| ertical distance | | | | | Vertical distan |
| surface and the | I \ L Vertical water | لـــــا لـــــا الـــــا
depths (cm) | | | between the w
surface and th |
| water mark (m) | | | | | waler mark (m |
| tiparian zone width | light honk (m) | Notes on cross-section measure | ement | | |
| ank material Assess | % composition for each bank
Left bank Right bank | Substrate composition
Assess % composition in the area of bed 5m eith
the cross-section. | ier sid e of | Asses
Filamentous algae cover | s in the area 5m either side of the cross section $65-90\%$ >90% |
| edrock | | Bedrock | | | |
| oulder (>256mm) | ········· | Boulder (>256mm) | | Periphyton cover | |
| obble (64-256mm) | <u> </u> | Cobble (64-256mm) | × | < 10% | 65-90%>90% |
| 2DDIE (16-64mm) | | Pebble (16-64mm) | | Moss cover | |
| ravel (2-15mm) | <u> </u> | Gravel (2-16mm) | Tota | | 65-90% > 90% |
| and (0.06-2mm) | | Sand (0.06-2mm) | <u> </u> | | |
| INES (silt and clay, <0.06ma | | Fines (sit and clay <0.06mm) |) | Detritus cover | |
| | · 1 | | - | | |

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| AUSRIVAS Physical Assessment Protocol Field Data Sheets | Page 1 | Site No. 62H 104Date 22917 |
|---|----------------|--|
| Date 22/9/17 Site No. LOA alt Time 9. | 00an | Recorder's Name LL+JS |
| River Name Rocky Creeks Location Postr | nan's k | Lidge Rd - postmans hold |
| Veather Clear Sunny Rain in last week? Y [] N [Y Pl | hotograph numb | pers and details 12 iphone NESW |
| atitude: Longitude: | | |
| PS Name and Datum | | and a second sec |
| LANFORM SKETCH OF SITE | nin fasturas | LENGTH OF SAMPLING SITE |
| ft bank is facing downstream, | am realures. | Bankfull width (m) |
| lefts to photos | | x 10 |
| | | Length of sampling site(OO (m) |
| | | Notes
* Bridge crossing for Postmans Rille
* Access track to creek littler present. |
| Native rainbow ~ see ploto
Glassfish. | | |
| | | |
| Ruple swamp hers | | |
| Nelcone snallows
Pied Commat | | BEFORE LEAVING THE
SITE, CHECK DATA |
| Turtles seen: 10 cm diameter shar | + Neck | THAT ALL VARIABLES |

Acknowledgments - The content and layout of these data sheets are derived from the sheets used in the River Habitat Audit Procedure (Anderson, 1993a), AUSRIVAS, the Index of Stream Condition (Ladson and White, 1999 and DNRE Victoria) and the River Habitat Survey (Raven et al., 1998).

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| | - | | - | |
|----|----|------|---|--|
| 23 | 22 | CI C | | |
| | | uc | | |

| BASIC WATER CHEMISTRY
Refs & Surface works sheet
Temperature
Conductivity
Dissolved Oxygen | <u>Units</u>
[°] c

mg l ⁻¹ | Valley shape
Choose one category only
Steep valley
Shallow valley | Local impacts on streams Choose one or more categories and describe the detail of each Sand or gravel mining Sewage effluent Other mining Channel straightening Road Bestmans River improvement works |
|---|---|---|--|
| Dissolved Oxygen Sat.
pH
Turbidity
Total phosphorus
Total nitrogen
ALKALINITY
Amount of water
Amount of H SO | % | Broad valley
Gorge
Symmetrical
floodplain
Asymmetrical | Bridge / culvert / wharf Water extraction Ford / ramp Dredging Discharge pipe Grazing Forestry activities Litter Sugar mill Recreation Irrigation run-off or pipe outlet Other |
| Alkalinity Floodplain width Floodplain features | mi
mg [⁻¹ | Average (m) | Local landuse
Choose one category for each bank
Left Right
Native forest |
| Choose one or more features when present Sampling site has no distinct floodplain Oxbows / billabongs Body of water occupying a former river meander, isolated by a shift in the stream channel Remnant channels Formed during a previous hydrological regime. May be infilled with sediment Flood channels A channel that distributes water onto the floodplain and off the floodplain during floods | Scr
Sho
alor
Spl
Sm
ove
and
Flo
Scr
clea | oll systems
ort, crescentic strips or patches formed
ing the inner bank of a stream meander
ays
all alluvial fan formed where an
erloaded stream breaks through a levee
I deposits material on the floodplain
odplain scours
our holes formed by the concentrated
aring and digging action of flowing water
floodplain features present
odplain present at the sampling site but
as not contain any of the above features | Native grassland (not grazed) Grazing (native or non-native pasture) Exotic grassland (lawns etc., no grazing) Forestry Native [][] Pine [][] Cropped Rainfed [][] Irrigated [][] Rural Ommercial Industrial or intensive agricultural Recreation Other Road Meene |



Choose one category only. Sites with valley vegetation cleared on BOTH sides, but with riparian vegetation in good condition should be scored in the high disturbance category. Words within the drawings summarise the detailed text about the state of the riparian and valley vegetation for each category.



bedrock on banks 1 bashing habital for tuctles Page 4 Page 4 Site No. 10 A Date 22,09.17 Type of bars Physical barriers to local fish passage Extent of bars Choose one or more categories Choose one category for each flow condition % of streambed forming a bar of any type \bigcirc % Base Low High Dominant sediment particle size on bars flow flow flow Bars absent Boulder/cobble [] Pebble [] Gravel [] X No passage Sand [] Silt/clay [] or ____ mm Side/point bars VEGETATED Channel modifications Choose one or more categories Very restricted No Side/point bars Reinforced X X passage modifications bridge . UNVEGETATED Men Moderately Mid-channel bars Desnagged Revegetated X restricted VEGETATED passage Mid-channel bars Partly restricted UNVEGETATED Dams and Infilled passage diversions 0 0 Bars around obstructions Berms or Good passage Resectioned embankments Braided channel Unrestricted Straightened Recently Infilled channel Signs of X passage work still channelised High flow deposits Type and height of barrier(s) bedrock + evensue 00 Realigned Channelised Works old Judha clamps ~ 1m and in the past revegetated Channel shape Choose one category only



Tue bidde high causing low



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Page 6 Site
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Site No. ____ Date ____

Extent of bedform features Macrophyte cover Assess % cover of the sampling site by each category. Total % composition for all features must equal 100% 701. % cover of emergent macrophytes Overall % cover of macrophytes Height >1m Waterfall % of site % cover of floating macrophytes Gradient >60° Est. Av. Length (m) Est. Av. Height (m) % cover of submerged macrophytes Est. Av. Gradient (°) % of site Step Height <1m Cascade Macrophyte composition Gradient 5-60° Est. Av. Length (m) Use a macrophyte field guide (i.e. Sainty and Jacobs, 1994) to aid identification. Strong currents Est. Av. Height (m) Listed macrophytes can be changed to reflect the common taxa present in each State or Territory. Est. Av. Gradient (°) N denotes a native taxa and I denotes an introduced taxa Gradient 3-5° Rapid % of site Emergent macrophytes Submerged macrophytes Strong currents % % Rocks break Est. Av. Length (m) Present cover Present cover surface Est. Av. Depth (m) Brachiaria (Para Grass) | Ceratophyllum (Hornwort) N Est. Av. Width (m) Crassula (Crassula) N Chara (Stonewart) N Gradient 1-3° Riffle % of site 30 Cyperus (Sedge) I/N Elodea (Canadian Pondweed) I Moderate currents Est. Av. Length (m) Surface unbroken Eleocharis (Spikerush) N Myriophyllum (Water Milfoil) I/N Est. Av. Depth (m) but unsmooth Est. Av. Width (m) Juncus (Rush) I/N 10 Nitella (Stonewart) N Glide Paspalum (Water Couch) N Potamogeton (Pondweed) N Gradient 1-3° % of site Small currents Est. Av. Length (m) Phragmites (Common Reed) N Triglochin (Water Ribbon) N Surface unbroken Est. Av. Depth (m) and smooth Ranunculus (Buttercup) 1 Vallisneria (Ribbonweed) N Est. Av. Width (m) Scirpus (Clubrush) N Other Run Gradient 1-3° % of site Triglochin (Water Ribbon) N Other Small but distinct Est. Av. Length (m) & uniform current 30 Typha (Cumbungi) N Other Surface unbroken Est. Av. Depth (m) Other Est. Av. Width (m) Floating macrophytes Other Pool Present Area where 00 % of site stream widens or Other Azolla (Azolla) N 100 Est. Av. Length (m) deepens and Est. Av. Depth (m) current declines Callitriche (Starwart) | 4m Est. Av. Width (m) Other Backwater % of site Other A reasonable sized (>20% of channel Est. Av. Length (m) Other width) cut-off Est. Av. Depth (m) section away from Overall % cover of native macrophyte taxa Est. Av. Width (m) Total should equal overall % cover Overall % cover of native macrophyte taxa of macrophytes from above Note: An additional response variable planform channel pattern

Note: An additional response variable <u>planform channel patten</u> is measured in the office Total should equal overal % cover of macrophytes

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| Pag | e / | |
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Site No. <u>10 A</u> Date <u>ZZ.09.17</u>

| Bed compaction
Choose one category only | Sediment matrix
Choose one category only |
|---|---|
| Tightly packed, armoured
Array of sediment sizes,
overlapping, tightly packed and
very hard to dislodge | Bedrock |
| Packed, unarmoured
Array of sediment sizes,
overlapping, tightly packed but
can be dislodged with moderate | Open framework
0-5% fine sediment, i
availability of interstit |
| Moderate compaction
Array of sediment sizes, little
overlapping, some packing but
can be dislodged with moderate | Matrix filled conta
framework
5-32% fine sediment,
availability of interstit |
| Low compaction (1)
Limited range of sediment
sizes, little overlapping, some
packing and structure but can
be dislodged very easily | Framework dilate
32-60% fine sedimen
availability of interstit |
| Low compaction (2)
Loose array of fine sediments,
no overlapping, no packing and
structure and can be dislodged
very easily | Matrix dominated
>60% fine sediment,
spaces virtually abser |

Bed stability rating Choose one category only

Unstable - eroding



Sediment matrix

Sediment angularity Choose one category only Assess cobble, pebble and gravel fractions only



In the USEPA Habitat Assessment on the following pages, be sure to use the correct form for high or low gradient streams



Unstable - depositing

| Severe erosion | Moderate erosion | Bed stable | Moderate deposition | Severe deposition |
|---|---|--|--|---|
| Streambed scoured of fine
sediments. Signs of channel
deepening. Bare, severely eroded
banks. Erosion heads. Steep
streambed caused by erosion. | Little fine sediment present. Signs
of channel deepening. Eroded
banks. Streambed deep and
narrow. Steep streambed
comprised of unconsolidated
(loosely arranged and unpacked)
material | A range of sediment sizes present in
the streambed. Channel is in a
'relatively natural' state (not
deepened or infilled). Bed and bar
sediments are roughly the same
size. Banks stable. Streambed
comprised of consolidated
(tightly arranged and packed) | Moderate build-up of fine sediments
at obstructions and bars.
Streambed flat and uniform.
Channel wide and shallow. | Extensive build up of fine sediments
to form a flat bed. Channel blocked,
but wide and shallow. Bars large
and covering most of the bed or
banks. Streambed comprised of
unconsolidated (loosely arranged
and unpacked) material. |

- Stable

AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 8 Site No. _____ Date _____

USEPA Habitat Assessment Circle a score for each parameter

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HIGH GRADIENT STREAMS

Page 1 of 2

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but recent
channelization is not
present. | | | | | | Charvelization may be
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or shoring structures
present on both backs;
and 40 to 80% of stream
reach charm≦zed and
dishipted. | | | | | | Barks shored with
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80% of the stream reach
drameized and
disrupted, insteam
habitat greatly altered or
removed entirely. | | | | | |
| SCORE | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | Б | 7 | 6 | 5 | 4 | э | 2 | 1 | Q | | |

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AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 9 Site No. ______ Date _____

USEPA Habitat Assessment Circle a score for each parameter

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HIGH GRADIENT STREAMS

Page 2 of 2

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habkat, distance
between filles divided
by the width of hide
stream is a ratio of >25. | | | | | | | | | |
| SCORE | 20 | 19 | 18 | 17 | £6 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | B | 7 | 6 | 5 | 4 | 3 | 2 | t | D | |
| 8.
Bank stability
(score each bank) | Bank
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| SCORE | Left | bank | T | 10 | 9 | 8 | T | 7 | | 6 | 5 | | 4 | | 3 | 1 | ! | | 1 | 0 | 1 | |
| SCORE | Figh | il bars | < ⁻ | 10 | 3 | t | 1 | 7 | | 6 | 5 | | 4 | | 3 | 2 | | | 1 | 1 | 1 | |
| 9.
Vegetative
protection
(score each bank) | More than 50% of the
streambank surfaces
and impectate inparian
zone covered by naive
vegetation, inclusion
treas, understang
strutts, or non woody
macrophytes, vegetative
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| 10.
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activities [Le. roads,
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TOTAL HIGH GRADIENT HABITAT SCORE



AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 10
Site No. _____ Date _____

| Habitat | | | | | | | | 0 | Cond | ition | cate | eaor | v | | | | | | _ | | |
|---|--|---|---|--|---------------------------------|--|---|---|--|-------------------------------|--|--|--|--|------------------------------|---|---|---|--|--|--------------------|
| parameter | | Ex | celle | ent | | | (| Good | 1 | | | 3 | Fair | | - | | | Po | or | | _ |
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| SCORE | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 2.
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| SCORE | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 1 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 3.
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| 4.
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I OW GRADIENT STREAMS

AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 11 Site No. 10 A Date 22-09.17

USEPA Habitat Assessment Circle a score for each parameter

LOW GRADIENT STREAMS

Page 2 of 2

5

Habitat Condition category parameter Excellent Good Fair Poor The bends in the stream The bends in the stream The bends in the stream Channel straight: 7 waterway has been increase the stream increase the stream increase the stream 1 to Channel length 3 to 4 times length 2 to 3 times 2 times longer than if it channelized for a long sinuosity longer than if it was in a longer than if it was in a was in a straight line. distance. straight line. (Note straight line. channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas). SCORE 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 8. Banks stable; evidence Moderately stable; Moderately unstable; 30-Unstable; many eroded of erosion or bank failure infrequent, small areas 60% of bank in reach areas: 'raw' areas Bank stability absent or minimal; little of erosion mostly healed has areas of erosion; frequent along straight (score each bank) potential for future over. 5-30% of bank in sections and bends; high erosion potential problems. <5% of bank reach has areas of during floods. obvious bank sloughing; affected erosion. 60-100% of bank has erosional scars. SCORE 10 9 Left bank 8 7 6 5 4 3 2 1 0 SCORE Right bank 10 9 8 7 6 5 4 3 2 1 0 9. More than 90% of the 70-90% of the 50-70% of the Less than 50% of the streambank surfaces streambank surfaces streambank surfaces streambank surfaces Vegetative and immediate riparian covered by native covered by vegetation; covered by vegetation; protection zone covered by native vegetation, but one class disruption obvious; disruption of streambank (score each bank) vegetation, including of plants is not wellvegetation is very high; patches of bare soil or trees, understorey represented; disruption closely cropped vegetation has been shrubs, or non woody evident but not affecting vegetation common; less removed to 5 full plant growth potential than one-half of the macrophytes; vegetative centimetres or less in disruption through to any great extent; potential plant stubble average stubble height. grazing or mowing more than one half of height remaining. minimal or not evident the potential plant aimost all plants allowed stubble height to grow naturally. remaining SCORE 10 9 Left bank (8) 7 6 5 4 3 2 0 1 SCORE Right bank 10 9 (8) 7 6 5 4 3 2 1 0 10. Width of riparian zone Width of riparian zone Width of riparian zone Width of riparian zone 6->18 metres; human 12-18 metres; human 12 metres; human <6 metres; little or no Riparian zone activities (i.e. roads. activities have impacted activities have impacted riparian vegetation is score lawns, crops etc.) have the riparian zone only present because of the riparian zone a great (score each bank) not impacted the riparian minimally. deal. human activities. 700e SCORE 10 9 0 0 Left bank 8 7 6 5 4 3 2 SCORE Right bank 10 9 8 7 6 5 4 3 2 h 0

TOTAL LOW GRADIENT HABITAT SCORE



| AUSRIVAS Physical and Chen | nical Assessment Protocol | Field Data Sheets | Page 12 |
|----------------------------|---------------------------|--------------------------|---------|
|----------------------------|---------------------------|--------------------------|---------|

Site No. ____ Date ____

| Channel cross-sections and variables | to | be measured | in th | e area around | a cross section |
|--------------------------------------|----|-------------|-------|---------------|-----------------|
|--------------------------------------|----|-------------|-------|---------------|-----------------|

Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at homogeneous sampling sites (generally lowland streams) and three cross-sections at heterogeneous sampling sites (generally upland streams). Where the water level at the time of sampling is at or near the water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

| Cross-Section Sketch | h | Cros | s-section number of/ |
|--|---|-----------------|--|
| | | Type of | bedform at the cross-section |
| The channel sketch should show in crost the water surface, watermark and bankd outcrops and snags encountered at the | ss-section the shape of the channel and include the location of
ull points. Also show other features such as bars, rocky
cross section, | Strea
Stream | Bankfull channel width (m)
(=total of boxes A+B+C)
arm width at the water mark (m)
width at the water surface (m) |
| width (m) | istances (m) | | |
| Vertical distance
between the water
surface and the
water mark (m) | Comparison (cm) | | Vertical distance
between the was
surface and the
water mark (m) |
| Riparian zone width | Notes on cross-section measurem | nent | |
| Bank material Assess % composition for each bank
Left bank Right bank
Bedrock | Substrate composition Assess % composition in the area of bed 5m either the cross-section. Bedrock Boulder (>256mm) Cobble (64-256mm) | side of | Assess in the area 5m either side of the cross section <10% |
| CODDIC (04-230(1111) | CODDIE (04-230mm) | 8 | |

| noordino i mondi dhe onchinda Assessarche i redeveri tele sate oncers i age is | AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 13 | |
|--|--|--|
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Date _____

Site No.

Channel cross-sections and variables to be measured in the area around a cross section

Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at homogeneous sampling sites (generally lowland streams) and three cross-sections at helerogeneous sampling sites (generally upland streams). Where the water level at the time of sampling is at or near the water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

| | Cross-section sketch | | Cros | s-section number | of |
|--|---|--|-------------------|--|---|
| | | | Type of
Riffle | bedform at the cross-section | er |
| 8ank height (m) | The charges' skelch should show in cross
fre water surface, watermark and bankfu
outgrops and shags succurtered at the co | section the shape of the channel and include the locatio
points. Also show other features such as bars, rocky
css section. | Strea
Stream | Bankfull channel width (m)
(=total of boxes A+B+C)
m width at the water mark (m)
width at the water surface (m) | Bank height (m) |
| Bank
width (m) | Horizontal dis | ances (m) | | | Vertical distance
between the water
surface and the
water mark (m) |
| Riparian zone width | linké kanla (m) | Notes on cross-section mea | surement | | |
| Bank material Assess | % composition for each bank
Left bank Right bank | Substrate composition
Assess % composition in the area of bed 5
the cross-section. | m either side of | Asses
Filamentous algae cover | s in the area 5m either side of
the cross section |
| Bedrock
Boulder (>256mm)
Cobble (64-256mm) | | Bedrock
Boulder (>256mm)
Cobble (64-256mm) | } | Periphyton cover <10% | 65-90% >90% |
| Pebble (16-64mm)
Gravel (2-16mm)
Sand (0.06-2mm) |
 | Pebble (16-64mm)
Gravel (2-16mm)
Sand (0.06-2mm) | Total 10(| Moss cover | 65-90% >90% |
| Fines (sil and clay, <0.06mm | ا کے بی کریں
Total 100% each | Fines (silt and clay <0.06mm) | J | Uetritus cover | 65-90% >90% |

| AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 14 | |
|--|--|
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Site No. _____

Date _____

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<</p>

Channel cross-sections and variables to be measured in the area around a cross section

. . .

Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at homogeneous sampling sites (generally ownand streams) and three cross-sections at heterogeneous sampling sites (generally upland streams). Where the water level at the time of sampling is at or near the water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

| Cross | s-section sketch | | Cros | s-section number | of |
|--|--|--|---|--|--|
| Ink height (m) | rel sketch should show in cross
surface, palermark and bandod | section the shape of the channel and include the location of
i points. Also show other features such as bars, rocky | Type of
Riffle
Strea | bedform at the cross-section
Run Pcol Cascade Other
Bankfull channel width (m)
(=total of boxes A+B+C)
m width at the water mark (m) | er
Bank height |
| Bank
width (m) | Horizontal dis | ances (m) | [| | Vertical distant
between the w
surface and th
water mark (m |
| iparian zone width | nk (m) | | | | |
| Bank material Assess % compo
lectrock
Boulder (>256mm)
Cobble (64-256mm)
Pebble (16-64mm)
Gravel (2-16mm) | Left bank Right bank | Substrate composition Assess % composition in the area of bed 5m eithe cross-section. Bedrock | الله الله الله الله الله الله الله الله | Assess
Filamentous algae cover
<pre></pre> | s in the area 5m either side of
the cross section
65-90% >90%
65-90% >90% |
| Tines (silt and day. <0.02mm) | ترجیب کرجیٹ
Total 100% each | Fines (silt and clay <0.26mm) |) | Detritus cover | 65-90%>90% |

-----:_

| AUSKIVAS PRYSICAI ASSESSM | ent Protocol Field Data Sheets | Page 1 | Site No Date |
|---|--|------------------------|---|
| Date 22.09.17 | Site No. <u>Fa</u> alt Time | 1100 | Recorder's Name <u>LL</u> + JS |
| River Name | Location | | |
| Neather Fire + SUMNY. | Rain in last week?Y [] N [👌 | Photograph numb | ers and details Refer 22 iphone |
| Latitude: 273133 | Longitude: 전문 이 문 이 문 이 가 이 이 이 이 이 이 이 이 이 이 이 이 이 | | NESW |
| GPS Name and Datum | | | |
| PLANFORM SKETCH OF SITE
including bedform types, location of cross-se
Left bank is facing downstream.
Refs to photos | ctions, access points, landmarks and natural or artificial channel o | r floodplain features. | LENGTH OF SAMPLING SITE
Bankfull width(m)
x 10
Length of sampling site <u>100</u> . (m)
Notes
<u>Bed wel road crossing for</u>
<u>Six Mile Geak</u>
<u>Overhead power times power kiner</u>
<u>Creek. Signs of historical char</u>
<u>for power easement</u> . |
| | | | BEFORE LEAVING THE
SITE, CHECK DATA
SHEETS TO ENSURE
THAT ALL VARIABLES |

Acknowledgments - The content and layout of these data sheets are derived from the sheets used in the River Habitat Audit Procedure (Anderson, 1993a), AUSRIVAS, the Index of Stream Condition (Ladson and White, 1999 and DNRE Victoria) and the River Habitat Survey (Raven et al., 1998).
|
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|--------|----|---|
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Pa | ap | |
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Site No.

Date

| BASIC WATER CHEMISTRY | Units | Valley shape
Choose one category only | Local impacts on streams
Choose one or more categories and describe the detail of each |
|--|--------------------|--|---|
| Temperature | °c | Steep valley | Sand or gravel mining Sewage effluent |
| Conductivity | | | Other mining Channel straightening |
| Dissolved Oxygen | mg l ⁻¹ | Shallow valley | Road River improvement works |
| Dissolved Oxygen Sat. | % | | Bridge / culvert / wharf Water extraction |
| pH | | Broad valley | Ford / ramp Dredging |
| Turbidity | | | Discharge pipe Grazing |
| Total phosphorus | | Gorge | Forestry activities |
| Total nitrogen | | A I | Sugar mill Recreation |
| ALKALINITY | | Symmetrical | Irrigation run-off or Other |
| Amount of water | ml | noodpiain | Description Red (and special for Six |
| Amount of H ₂ SO ₄ | ml | Asymmetrical | Mile Ck road crossing |
| Alkalinity | mg l ⁻¹ | | 2 RCPNO.Sm diameter under road, |
| | | 1 | Local landuse |
| Floodplain width | | Average (m) | Left Right |
| Floodplain fostures | | | Native forest |
| Choose one or more features when present | | | Native grassland (not grazed) |
| X Sampling site has no distinct floodplain | Scr | roll systems | Grazing (native or non-native pasture) |
| Oxbows / billabongs | alor | ng the inner bank of a stream meander | Exotic grassland (lawns etc., no grazing) |
| meander, isolated by a shift in the stream | Spl | lays | Forestry Native [][] Pine [][] |
| channel | Sm | all alluvial fan formed where an
erloaded stream breaks through a levee | Cropped Rainfed [][] Irrigated [2][] |
| Formed during a previous hydrological | and | deposits material on the floodplain | Urban residential |
| regime. May be infilled with sediment | Flo | odplain scours | Commercial |
| Flood channels A channel that distributes water onto the | clea | aring and digging action of flowing water | Industrial or intensive agricultural |
| floodplain and off the floodplain during | No | floodplain features present | Recreation present camp facilities |
| noous | Flo | Other | |



| Page | 4 | S |
|--------|---|---|
| I LUGO | | - |

Site No. Date



| Bank shape
Choose one category for each bank
Left Right
bank bank | Bank slope
Choose one category for each bank
Left Right
bank bank | Sediment oils absent light moderate profuse | | | | | | |
|---|--|---|--|--|--|--|--|--|
| Concave | Vertical
80 - 90° | none flecks globs sheen slick | | | | | | |
| Convex Z | Steep
60 - 80° | Sediment odours | | | | | | |
| Stepped | Moderate
30 - 60° | anaerobic other Water odours | | | | | | |
| Wide lower bench | Low
10 - 30° | normal/none sewage petroleum chemical | | | | | | |
| | Flat <10° | Turbidity (visual assessment) | | | | | | |
| Factors affecting bank stability Choose one or more categories None Cleared Mining Irrigation Runoff draw-down Stock Reservoir access Flow and Yeral animals Drainpipes Other Other | Bedrock outcrops Assess % of each bank covered by bedrock outcrops % bedrock outcrops Left bank % bedrock outcrops Left bank Right Bank O Right Bank O Artificial bank protection measures Choose one or more categories None Fenced stock Fence structures Vegetation Levee banks Vegetation Plantings Logs strapped Rip rap Logs strapped Fenced human Concrete channel access Ining | Is water clarity reduced by: Suspended material Ussolved material (e.g mud, clay, organics) Water level at the time of sampling Dry No flow Low Baseflow or near basef High Flood (don't sample) Artificial features at the sampling site Choose one or more categories Major Minor Ford Bridge Culvert Other weir Six Description Bed Large woody debris | | | | | | |

Page 6

Extent of bedform features Macrophyte cover Assess % cover of the sampling site by each category. Total should equal overall % cover of macrophytes Total % composition for all features must equal 100% Overall % cover of macrophytes % cover of emergent macrophytes Height >1m % of site Waterfall % cover of floating macrophytes Gradient >60° Est. Av. Length (m) Est. Av. Height (m) % cover of submerged macrophytes Est. Av. Gradient (°) % of site Step Height <1m Cascade Macrophyte composition Gradient 5-60° Est. Av. Length (m) Use a macrophyte field guide (i.e. Sainty and Jacobs, 1994) to aid identification. Strong currents Est. Av. Height (m) Listed macrophytes can be changed to reflect the common taxa present in each State or Territory. Est. Av. Gradient (°) N denotes a native taxa and I denotes an introduced taxa. Gradient 3-5° Rapid Emergent macrophytes % of site Submerged macrophytes Strong currents % % Rocks break Est. Av. Length (m) Present cover Present cover surface Est. Av. Depth (m) Ceratophyllum (Hornwort) N Brachiaria (Para Grass) | Est. Av. Width (m) Chara (Stonewart) N Crassula (Crassula) N Riffle Gradient 1-3° % of site Elødea (Canadian Pondweed) I Cyperus (Sedge) I/N Moderate currents Est. Av. Length (m) Surface unbroken Myriophyllum (Water Milfoil) I/N Eleocharis (Spikerush) N Est. Av. Depth (m) but unsmooth Est. Av. Width (m) Juncus (Rush) I/N Nitella (Stonewart) N Paspalum (Water Couch) N Potamogeton (Pondweed) N Glide Gradient 1-3° % of site Small currents Est. Av. Length (m) Triglochin (Water Ribbon) N Phragmites (Common Reed) N Surface unbroken Est. Av. Depth (m) and smooth Ranunculus (Buttercup) 1 Vallisneria (Ribbonweed) N Est. Av. Width (m) Other Scirpus (Clubrush) N Run Gradient 1-3° % of site Triglochin (Water Ribbon) N Other Small but distinct Est. Av. Length (m) & uniform current Typha (Cumbungi) N Other Surface unbroken Est. Av. Depth (m) Other Est. Av. Width (m) Floating macrophytes Other Present Pool Area where % of site stream widens or Other Azolla (Azolla) N Est. Av. Length (m) deepens and Est. Av. Depth (m) current declines Callitriche (Starwart) | Est. Av. Width (m) Other Backwater % of site Other A reasonable sized (>20% of channel Est. Av. Length (m) Other width) cut-off Est. Av. Depth (m) section away from Overall % cover of native macrophyte taxa Est. Av. Width (m) Total should equal overall % cover of macrophytes from above Overall % cover of native macrophyte taxa Note: An additional response variable planform channel pattern is measured in the office

| Dee | - | 7 | |
|-----|---|---|--|
| Pag | e | 1 | |

Site No. Ta alt Date 22.09.17

| Bed compa
Choose one | action
category only | Sediment matrix
Choose one category only | S |
|-------------------------|---|--|---|
| | Tightly packed, armoured
Array of sediment sizes,
overlapping, tightly packed and
very hard to dislodge | Bedrock | A |
| | Packed, unarmoured
Array of sediment sizes,
overlapping, tightly packed but
can be dislodged with moderate | Open framework
0-5% fine sediment, high
availability of interstitial spaces | |
| | Moderate compaction
Array of sediment sizes, little
overlapping, some packing but
can be dislodged with moderate | Matrix filled contact
framework
5-32% fine sediment, moderate
availability of interstitial spaces | |
| | Low compaction (1)
Limited range of sediment
sizes, little overlapping, some
packing and structure but can
be dislodged very easily | Framework dilated
32-60% fine sediment, low
availability of interstitial spaces | |
| | Low compaction (2)
Loose array of fine sediments,
no overlapping, no packing and
structure and can be dislodged
very easily | Matrix dominated
>60% fine sediment, interstitial
spaces virtually absent | |

Bed stability rating Choose one category only

| Unstable | e - eroding | Stable | Unstable | - depositing |
|---|---|---|---|--|
| Severe erosion
Streambed scoured of fine
sediments. Signs of channel
deepening. Bare, severely eroded
banks. Erosion heads. Steep
streambed caused by erosion. | Moderate erosion
Little fine sediment present. Signs
of channel deepening. Eroded
banks. Streambed deep and
narrow. Steep streambed
comprised of unconsolidated
(loosely arranged and unpacked)
material | Bed stable
A range of sediment sizes present in
the streambed. Channel is in a
'relatively natural' state (not
deepened or infilled). Bed and bar
sediments are roughly the same
size. Banks stable. Streambed
comprised of consolidated | Moderate deposition
Moderate build-up of fine sediments
at obstructions and bars.
Streambed flat and uniform.
Channel wide and shallow. | Severe deposition
Extensive build up of fine sediments
to form a flat bed. Channel blocked,
but wide and shallow. Bars large
and covering most of the bed or
banks. Streambed comprised of
unconsolidated (loosely arranged
and unpacked) material. |
| | | (tightly arranged and packed) material. | | |

Sediment angularity

Choose one category only Assess cobble, pebble and gravel fractions only



In the USEPA Habitat Assessment on the following pages, be sure to use the correct form for high or low gradient streams



AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 8 Site No. _____ Date _____

USEPA Habitat Assessment Circle a score for each parameter

Page 1 of 2

| Habitat | i | | | | | | | C | andi | іол | cate | gory | | | | | | | | | |
|---|--|----|-----------|------------|----|--|--|--|--|-----|---|--|--|---|----------------------------|--|-------------------------------------|---|---------------------------------|---------------|---------------|
| parameter | i – | Ex | celle | D I | | | _ | Geod | 1 | | | | Fair | | | | | Po | HC IT | | |
| 1.
Epifaunal
substrate /
available cover | Sreater than 70% of
substate favourable for
splaunal contribution and
5% power, mixed snags,
subserged logs, undertuk
barks, cobble or other
stable habitat and at stage
to abw full colonisation
potential (i.e. logs/snags
that are not new fail and
not transient). | | | | | 49-7
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freq
rema | ¢ | Less Ihan 20% Stable
habitat lack of habitat is
obvious, suborrate
urstable or lacking. | | | | | | | | | | |
| SCORE | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 8 | 5 | 4 | 3 | 2 | 1 | ٥ |
| 2.
Embeddedness | Grand, cotole and
bouter particles are 0-
25% surcounded by fine
sectimers. Layering of
cotole provides chrensky
of notes stars | | | | | Gra
tou
50%
sed | Gravel cobble and
boulder particles are 25-
50% suntrunded by fine
sediment. | | | | | rel, co
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| SCORE | 20 | 19 | 18 | 17 | 15 | 15 | 14 | 13 | 12 | 11 | to | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 3.
Velocity í depth
regime | AE four veiocitykleptn
regimes present (slow-
deep, slow-shatow, fast-
deep, fast-shatow), Stow
is <0.3m/s, deep is
<0.5m/s | | | | | Only 3 of the 4 recimes
present (if fast-shaker is
missing, score tower
than 8 missing other
regimes). | | | | | Criy 2 of the 4 habitat
regimes present (if fast-
shallow of slow-shallow
are missing, score low). | | | | | Dominated by 1
velocity/depth regime
(csuesty stow-deep). | | | | | |
| SCORE | 20 | 19 | 18 | 17 | 15 | 15 | 14 | 13 | 12 | 11 | 50 | 9 | 8 | 7 | E | 5 | 4 | 3 | 2 | 1 | 0 |
| 4.
Sediment
deposition | Little or no enlargement of
islands or point bars and
less than 5% of the bottom
affacted by sediment
deposition. | | | | | Son
bar
fices
sec
bot
dep | Some new increase in
bar formation, mostly
from gravel, sand or frite
sectment, S-SDR, or the
bottom affected, sight
deposition in pools. | | | | | ierate
grave
bars;
bars;
bars;
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d or fi
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det
a | Heavy deposits of Ene
material, increases bar
development, more than
doing it de battom
changing it equation,
pools atmost absent due
to substantial sectment
deposition. | | | | | r
an
Jæ |
| SCORE | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | â | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 5.
Channel flow
status | 20 13 16 17 16
Water reaches base of
both iower banks, and
chikrai amount of
channel substrate is
entropy | | | | | Wa
ara
QS
Sub | ter fills
Nable i
So of (
Sonale | s>75%
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stræte
rsed. | the
S | Very Stleswater a
channel and mostly
present as standing
pools | | | | | |
| SCORE | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 1.0 | 9 | 8 | 7 | 6 | 5 | 4 | 1 | 2 | 1 | 0 |
| 6.
Chaonel
alteration | Cremetzator, or
dredging absent or
minimal, szearn with
normal pattern. | | | | | Some charmetration
present, usually in areas
of bridge abuments;
existence of pest
charmetration, i.e.
charmetration, i.e.
charmetration, i.e.
but recent
charmetration is not | | | | | Ora
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d | Sanks shored with
gation or coment, over
a0% of the stream reach
charaketeriand
disrupted. Instream
habital greatly stiered or
removed entirely. | | | | | | | | |
| SCORE | 20 | 19 | 78 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | Ŧ | 3 | 2 | 1 | Đ |

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Continued over

AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 9 Site No. _____ Date _____

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USEPA Habitat Assessment Circle a score for each parameter

HIGH GRADIENT STREAMS

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Page 2 of 2

| Habitat | . | | _ | | | | ond | itior | on categozy | | | | | | | | | | | |
|---|---|---|---|---|--|---|--|--|--|---|-------------------------------------|---|--|--|---|-----|----|----|--|--|
| parameter | | Exce | llent | | | Ģ | iood | | | | | Fair | | | | Poo | ЪГ | | | |
| 7.
Frequency of
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dottar, das
d | or be
psovi
tance
vided
e
si 15 | ndi
nie
n | Conerally at Sal water or
shabox offles; poor
habots distance
between offles divided
by the width of the
stream is a ratio of >25. | | | | | |
| SCORE | 20 | 19 1 | 5 17 | 16 | 15 1 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 4 | 3 | 2 | 10 | | |
| 8.
Bank stability
(score each bank) | Bank
of en
abse
poter
poter
poter
affeo | es stable;
es ion or
nit or mir
nitai for t
lettis. <i
ted</i
 | ; evider
bark fa
ime); \$
uhae
%} of b | rce
Bure
Ste
ank | Victar
intrea,
of ens
over,
reach
erosio | ately
Jeral,
Sen I
5-30
has a
r. | slabi
smai
mostiy
Pis of t
areas | ≍
anea
ihea
ank
cr' | s
led
in | Mode
90%
has a
high i
durin | arati
rea
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ç D | ely unista
bank in m
is of eros
sion pale
conis, | ole, 3
sach
son;
rdial | Unstable: many eroded
areas; 'raw' areas
Irequent along straight
sections and sends;
abvious bank sloughing;
50-10055 of bank has | | | | | | |
| SCORE | Tey | bank | 10 | 8 | 8 | Ι | 7 | 1 | £ | 54 | | | | 3 | 2 | 1 | | J | | |
| SCORE | Righ | il bank | 5 | 1 | 7 | 1- | 6 | -5 | | 4 | - | 3 | 2 | 1 | | 0 | | | | |
| 9.
Vegetative
protection
(score each bank) | More
stream
and it
zone
vege
bess
shout
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dsnu
grad
atro
bight | Pan 90
mibank s
mmedial
covared
tation, in
covared
tation, in
station for
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Urface
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togh
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t exide
tts alo
ally | e
s
an
Me
t
stae
n;
wed | 70-90
stream
coverse
vegeta
of plan
repres
eviden
ful plan
to any
norre t
the pot
shubble
remain | the
k suff
but o
but o
not w
d; dist
codt i
set
one h
al pist
gif | 50-70
strea
cover
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heigh | All the set of the set | of the
ank surf
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n covia,
of bare :
xxoped
x comm
stall of :
part so
emaining | aces
ation
s:
color
an, le
he
atble | 51 | Sireambark surfaces
toward by vogetation
disruption of Sireambark,
vegetation is way Ngh;
vegetation has been
removed to 5
centimetres or less in
average subble height | | | | | | | | |
| SCORE | Leff | bænk | 10 | \$ | 8 | I | 7 | : | 6 | 5 | | 4 | : | 3 | . 2 | 1 | | 0 | | |
| SCORE | Righ | 1 bank | 10 | 3 | 8 | | 7 | | 6 | 5 | Ì | 4 | ; | 3 | 2 | 1 | | 0 | | |
| 10.
Rigarian zone
score
(score each bank) | Widt
>18 :
activi
lewrs
actir
zone | h of ngan
meires; i
bies (j.e.
s, orops
mpacled | Width
12-18
activiti
the rip
minists | Width of riparian zone
12-18 metres: human
activities have impacted
the riparian zone only
ministrally. | | | | | h di
etre
Sies
Cari | iriparian
es; huma
i heare in
fan zone | zone
B
pacia
a gre | Width of Inpatian zone
<5 metres; fille of no
hipatian vegetation is
present because of
human activates. | | | | | | | | |
| SCORE | Lefi | bank | nk 10 9 8 7 6 5 | | | | | 4 | : | 1 | 2 | 1 | | ¢ | | | | | | |
| SCORE | Righ | ri bank | 10 | 9 | 8 | | î | · | 6 | 5 | 1 | 4 | 1 | 3 | 2 | 1 | - | 0 | | |

TOTAL HIGH GRADIENT HABITAT SCORE



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| Habitat | | | | | | | | 0 | Cond | ition | cate | gon | V. | | | | | | | | | | | | | |
|---|--|--|--|---|--|--|--|--|--|--|--|--|--|---|--------------------------------|---|--|--|---|--|-------------------------------|--|--|--|--|--|
| parameter | | Ex | celle | ent | | | (| Good | t | | | - | Fair | | | | | Po | or | | | | | | | |
| I.
Epifaunal
substrate /
available cover | Greater than 50% of
substrate favourable for
epifaunal colonisation
and fish cover, mix of
snags, submerged logs,
undercut banks, cobble
or other stable habitat
and at stage to allow full
colonisation potential
(i.e. logs/snags that are
not new fall and not
transient). | | | 30-5
habi
full o
pote
habi
of po
of a
the f
not
colo
high | of south tink of stable
habitat; well-suited for
full colonisation
habitat for maintenance
of populations; presence
of additional substrate in
the form of newfall, but
not yet, prepared for
colonisation (may rate at
high end of scale). | | | | | 10-30% mix of stable
habitat habitat
availability less than
desirable; substrate
frequently disturbed or
removed. | | | | | | Less than 10% stable
habitat; lack of habitat is
obvious; substrate
unstable or lacking. | | | | | | | | | | |
| SCORE | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | |
| ool substrate haracterization | Mixt
mate
and
root
subr
com | Mixture of substrate
materials, with gravel
and firm sand prevalent,
root mats and
submerged vegetation
common. | | | | | Mixture of soft sand,
mud or clay, mud may
be dominant; some root
mats and submerged
vegetation present. | | | | | All mud or clay or sand
bottom; little or no root
mat; no submerged
vegetation. | | | | | rd-pa
trock
jetati | n cla
; no r
on. | y or
root r | mato | r | | | | | |
| SCORE | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | |
| 3.
Pool variability | Ever
shail
sma
deer | n mix i
low, la
il-shal | of larg
arge-d
low, s
s pres | je-
ieep,
smail-
sent | | Majority of pools large-
deep; very few shallow. | | | | | Shallow pools much
more prevalent than
deep pools. | | | | | | Majority of pools small-
shallow or pools absent. | | | | | | | | | |
| SCORE | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 10 | | | | | |
| l,
Sediment
Jeposition | Little
of isi
and
both
sedi | e or no
lands
less ti
om aff
ment o | o enia
or poi
han 2
fected
depos | rgeme
int bar
0% of
1 by
sition. | ent
rs
the | Son
bar
fron
sed
bott
dep | te new
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om aff
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20-50
fected
i in po | ease in
nostly
nd or f
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xols. | n
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t | Mod
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gravi
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bars
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sition in | | He
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thy;
ent d
fimer | ie
ar
han
due
ant | | | | | |
| SCORE | (20) | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | |
| 5.
Channel flow
status | Wat
both
mini
char
expo | er rea
Nower
Imal ar
Innel si
osed. | aches
r bank
mouni
ubstra | base
(s, an
t of
ate is | of
d | Wa
avai
<25
sub | ler fills
lable of
% of o
strate | s >75%
shann
shann
is exp | % of the
el; or
el
bosed | ne . | Water fills 25-75% of the
available channel,
and/or riffle substrates
are mostly exposed. | | | | | Very little water in
channel and mostly
present as standing
pools. | | | | | | | | | | |
| SCORE | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | |
| 6.
Channel
alteration | Cha
dred
mini
nom | nneliz
Iging a
mal, s
nal pa | cation
absen
stream
attern. | or
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n.with | 8 | Son
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| 00005 | - | | | | C. | | 1 | | | 1 | | 1 | 1. | - | 1. | - | | | - | | 1. | | | | | |

I OW GRADIENT STREAMS

| AUSRIVAS | Physical and | Chemical | Assessment | Protocol | Field Da | ta Sheets | Page 11 | |
|----------|--------------|----------|------------|----------|----------|-----------|---------|--|
| tite Me | | Data | | | | | | |

USEPA Habitat Assessment LC Circle a score for each parameter

LOW GRADIENT STREAMS

Page 2 of 2

Habitat Condition category parameter Excellent Good Fair Poor The bends in the stream The bends in the stream The bends in the stream Channel straight; 7. increase the stream increase the stream increase the stream 1 to waterway has been Channel length 3 to 4 times length 2 to 3 times 2 times longer than if it channelized for a long sinuosity longer than if it was in a longer than if it was in a was in a straight line. distance. straight line. (Note straight line. channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas). SCORE 8 20 19 18 17 16 15 14 13 12 11 10 9 17 5 4 3 2 1 0 6 8. Banks stable; evidence Moderately stable; Moderately unstable; 30-Unstable; many eroded 60% of bank in reach of erosion or bank failure infrequent, small areas areas: 'raw' areas Bank stability absent or minimal; little of erosion mostly healed has areas of erosion; frequent along straight (score each bank) potential for future over, 5-30% of bank in sections and bends; high erosion potential problems. <5% of bank reach has areas of during floods. obvious bank sloughing; affected. erosion. 60-100% of bank has erosional scars. SCORE 10 Left bank 9 8 7 6 5 4 3 2 1 0 SCORE 10 9 0 Right bank 8 7 6 5 4 3 2 1 9. More than 90% of the 70-90% of the 50-70% of the Less than 50% of the streambank surfaces streambank surfaces streambank surfaces streambank surfaces Vegetative covered by vegetation; and immediate riparian covered by native covered by vegetation; protection zone covered by native vegetation, but one class disruption obvious; disruption of streambank (score each bank) vegetation, including of plants is not wellpatches of bare soil or vegetation is very high; vegetation has been trees, understorey represented; disruption closely cropped shrubs, or non woody evident but not affecting vegetation common; less removed to 5 macrophytes, vegetative full plant growth potential than one-half of the centimetres or less in average stubble height. disruption through to any great extent; potential plant stubble grazing or mowing more than one half of Peight remaining. the potential plant minimal or not evident. stubble height + almost all plants allowed to grow naturally. remaining. SCORE 10 9 Left bank (8) 7 6 5 4 3 2 1 0 SCORE 10 Right bank 9 (8) 7 6 5 4 3 2 1 0 Width of riparian zone Width of riparian zone 10. Width of riparian zone 6-Width of riparian zone >18 metres; human 12-18 metres; human 12 metres; human <6 metres; little or no Riparian zone activities (i.e. roads, activities have impacted activities have impacted riparian vegetation is score lawns, crops etc.) have the riparian zone only the riparian zone a great present because of (score each bank) not impacted the riparian minimally. deal. human activities. zone. SCORE 10 9 (5) 0 Left bank 8 7 6 4 3 2 1 SCORE 15 Right bank 10 9 8 7 6 4 3 2 1 0

TOTAL LOW GRADIENT HABITAT SCORE

AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 12

Site No. 7 a alt Date 22.09.17.

Channel cross-sections and variables to be measured in the area around a cross section

Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at homogeneous sampling sites (generally lowland streams) and three cross-sections at heterogeneous sampling sites (generally upland streams). Where the water level at the time of sampling is at or near the water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

| | Cross-section sketch | | Cros | s-section numberl ofl |
|-------------------------------|--|--|-------------------|--|
| | | | Type of
Riffle | Bedform at the cross-section |
| Bank height (m) | | | | Bankfull channel width (m)
(=total of boxes A+B+C)
Bank height (m) |
| 7 | The shared states at the second | | Strea | m width at the water mark (m) 3.5_{A} |
| | the water surface, watermark and bankful
outcrops and snags encountered at the co | -section the shape of the channel and include the location of
I points. Also show other features such as bars, rocky
ross section. | Stream | width at the water surface (m) |
| Bank
width (m) ∠∵∽ в | Horizontal dis | tances (m) | | Bank
width (m) |
| Vertical distance | | | | |
| surface and the | | | | between the water |
| water mark (m) | Vertical Water | depuis (cm) | | water mark (m) |
| | | Notes on cross-section measurem | nent | |
| Riparian zone width | 10 | | | |
| Left bank _ 💋 (m) R | light bank <u>IO</u> (m) | | | |
| Bank material Assess | % composition for each bank
Left bank Right bank | Substrate composition
Assess % composition in the area of bed 5m either
the cross-section | side of | Assess in the area 5m either side of
the cross section |
| Bedrock | | Bedrock |) | / <10% 10-35% 35-65% 65-90% >90% |
| Boulder (>256mm) | | Boulder (>256mm) | _ | Periphyton cover |
| Cobble (64-256mm) | | Cobble (64-256mm) to | % | <10% |
| Pebble (16-64mm) | 5 5 | Pebble (16-64mm) | 2 ∕§ | Moss cover |
| Gravel (2-16mm) | 5 > | Gravel (2-16mm) | Total | |
| Sand (0.06-2mm) | | Sand (0.06-2mm) | 5 | / <10% 10-35% 35-65% 65-90% 290% |
| Fines (silt and clay, <0.06mm |) <u>40</u> <u>40</u> | Fines (silt and clay <0.06mm) | 0.) | Detritus cover |
| | Total 100% each | | , | [→] <10% 10–35% 35-65% 65-90% >90% |
| | | | | |

i

Date

Site No.

Channel cross-sections and variables to be measured in the area around a cross section

Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at homogeneous sampling sites (generally lowland streams) and three cross-sections at heterogeneous sampling sites (generally upland streams). Where the water level at the time of sampling is at or near the water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

| | Cross-section sketch | | Cro | ss-section number | of |
|---|--|--|-------------------|--|---|
| | | | Type o | of bedform at the cross-section | ner |
| Bank height (m) | The channel sketch should show in pross
Vie water surface, watermark and banks
outcrops and snags encountered at the p | section the shape of line channel and include the local
jocinity, Also show other features such as bars, roday
loss section. | end
Stream | Bankfull channel width (m)
(=total of boxes A+B+C)
eam width at the water mark (m) | Bank height (m) |
| Bank
width (m) | Horizontal d'stances (m)
Horizontal d'stances (m)
Vertical water depthis (cm) | | | | Vertical distance
between the water
surface and the
water mark (m) |
| Riparian zone width | | Notes on cross-section mea | surement | | |
| Bank material Assess | Ignt Dark (m)
% composition for each bank
Left bank Right bank | Substrate composition
Assess % composition in the area of bed a
the cross-section. | 5m either side of | Asses | is in the area 5m either side of
the cross section |
| Bedrock
Boulder (>256mm)
Cobble (64-256mm)
Pebble (16-64mm)
Gravel (2-16mm) | | Bedrock
Boulder (>256mm)
Cobble (64-256mm)
Pebble (16-64mm)
Gravel (2-16mm) | T 4491407% | Periphyton cover
<pre></pre> | 65-90% >90% |
| Sano (0.06-2mm)
Fines (sill and clay, ⊲0.06mm) | ا
توtal 100% each | Sandi (0.06-2mm)
Fines (sill and clay <0.06mm) |) | Detritus cover |
 |

| AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page ' | 4 |
|---|---|
|---|---|

Site No.

Date _____

Channel cross-sections and variables to be measured in the area around a cross section

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Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding. Two cross-sections are required at homogeneous sampling sites (generally lowland streams) and three cross-sections at heterogeneous sampling sites (generally upland streams). Where the water level at the time of sampling is at or near the water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

| Cross-section sketc | ייייייייייייייייייייייייייייייייייייי | Cros | s-section number _ | of |
|--|---|-----------------|--|--|
| | | Type of | bedform at the cross-section | Diner |
| ank height (m)
The channel sketch should show in cro
the water surface, watermark and benk
outcops and snags encountered at the | is-section the shape of the channel and include the location of
UP points. Also show other features such as tars, rocky
mass section. | Strea
Stream | Bankfull channel width (m)
(=total of boxes A+B+C)
m width at the water mark (m)
width at the water surface (m) | Bank heigt |
| Horizontal di
vidth (m) Figure A constraints Horizontal di Horizontal di Horizontal di Vertical distance Vertical distance Vertical distance Vertical water Vertical water Vertical water Vertical water | | | | Vertical dista |
| liparian zone width
eft bank (m) Richt bank (m) | Notes on cross-section measurem | ent | | |
| Bank materiał Assess % composition for each bank
Left bank Right bank | Substrate composition
Assess % composition in the area of bed 5m either s
the cross-section. | side of | As
Filamentous algae cover | sess in the area Sin either side of
the cross section |
| iedrock | Bedrock | _) | | м <u>Со-зо</u> м Съзом |
| Oulder (>255mm) | Bouider (>256mm) | | Periphyton cover | |
| obble (64-256mm) | Cobble (64-256mm) | % | <10% 10–35% 35-65 | % 🔲 65-90% 🗍 >90% |
| ebble (16-64mm) | | {10} | Moss cover | |
| ravel (2-16mm) | Gravel (2-16mm) | | | |
| and (0.06-2m.m) | Sand (0.06-2mm) | ' | | % [_] 05-90% [_]>90% |
| · · · · · · · · · · · · · · · · · · · | | | | |

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