:`ck`@[a]HUh]cb`UbX`F]jYfVUb_`DfchYWf]cb`8 Yg][b`lg]b[`5 gmaaYhf]WU` :`ck`AUdd]b[`cb`U`D\ mg]WU`<mXfUi`]WAcXY

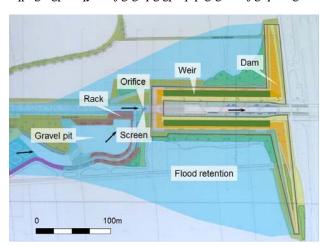
X^&•^\}^^•ÁZ•[|EÊÁOE; å\^ā; ãÁp & E||æ FÁ

FÉSæà[¦æa[¦^Á(;¦Á0E]]|ànàÁR^â¦æĕ|ã&+PÉMyāç^\!•ā6`Á;√Á0E]||ànàÁù&an}&^•Áv^•o^\;}Áù¸āc^\|æ)àÉARÒÙËÙUÉÁ. PÒÚQOÆŐ^}^çæÁFG€GÉÄÙ¸āc^\|æ)åÁ

? Ynk cfXg. "Cu{oo gtkecnhap."Xgaqek{"hlgrf"ocrrkpi."Qtkhleg"igqogt("fgukip."Tkxg"dcpnirtqvgevkqp"

%" ⇒blfcXiWM]cb

Ko" yi g" htco g" qh" yi g" yi ktf" uvci g" qh" yi g" Cktg" Tkxgt" tgxkcrkucvkqp" r tqlgev." kpwpf cvkqp" tkum' qh" I gpgxc" ku" o kki cvgf" d{" cp" qtlkheg/y gkt" uvtwewtg" {kgrf kpi " hqqf" tgvgpvkqp" *Hki wtg"3+0' Wrutgco " htqo " yi ku" f kuej cti g" rko kcvkqp"uvtwewtg" yi g"tgxkcrkugf "tgcej "qh"yi g"Cktg"Tkxgt" ku"ko r rgo gpvgf "qxgt"ku"hqto gt"tki j v'dcpm'cpf "eqppgevgf" q" yi g"qtkheg" yi tqwi j "c"i tcxgri'r kv0' Vj g"hqqf" tgvgpvkqp" hkgrf "gzvgpf u"qxgt" yi g"i tcxgri'r kv'cpf "yi g"tgxkcrkugf "tkxgt" tgcej 0' Vj g" hqto gt" tgevkrkpgct" tkxgt" tgcej " czkcm(" eqppgevgf "vq"yi g"qtkheg"ku"qpn("uwr r rkgf"d{"f tckpci g0'C" eqpxgti gpv'hqy "ku'yi gtghqtg"gpeqwpvgtgf "cv'yi g"qtkheg0"



Hki wtg" 3 < U{ pqr vke" xkgy " qh" yi g" Cktg" Tkxgt" kpwpf cvkqp" tkun' o kki cvkqp"urtwewtgu0'Vj g"qtkhleg"ko r ngo gpvgf "kp" yi g"f co "{ kgrf u" f knej cti g'nko kcvkqp"d{ "hrqqf "tgvgpvkqp0'

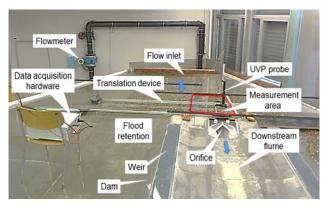
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y j kej "o wuv'dg'hqwi j v'kp"qtf gt"\q"cxqkf "dcpm'gtqukqp0'Vj g" cu{o o gvtkecn'hqy "r cwgtp"o c{"cnuq"cngt"\yi g"j {f tcwrke" eqo r qt vo gpv'qh''\yi g"qtkhkeg"tgur qpukdrg"qh''\yi g"f kuej cti g" rko kxc\qp0'Hqt"\yi gug"tckuqpu"hqy "r cwgtp"pggf gf "\q"dg" o qpkqtgf "qp"c"rj {ukecn'j {f tcwrke"o qf gr0''

&"9I dYf]a YbHJ gYHi d

Vj g"gzr gtko gpvcn'kpxguki cvkqpu"y gtg"eqpf wevgf "cv' vj g" Ncdqtcvqt {" hqt" Crrnkgf" J {ftcwkeu" *NJ C+" qh" J GRKC" I gpgxc."EJ 0'Vj g"rj {ukecn'o qf gn'qh'vj g"Cktg"Tkxgt"y cu" eqpuntwevgf "y kj "c"3-62"*o qf gn'<"rtqvqv{r g+"ngpi vj "uecng" *Hki wtg"4+0' Hnqy " cpcn{ugu" qdg{gf" Htqwf g" uko krctkx{0' Xgnqekx{"uecng"kp"vj gug"eqpf kkqpu"dgeco g"3-805470'

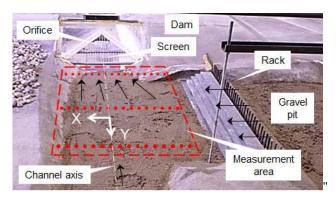
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Hki wtg"4<"Rctvkcn'xkgy "qh'vj g"Cktg"Tkxgt"rj {ukecn'o qf gn'cv'vj g" NJ C"qh'J GRKC."y ksj "vj g"hrqy "o qpkxqtkpi "hcekrkkkgu"kpuvcmgf "wruvtgco 'htqo "vj g'f kuej cti g'rho kskpi "qtkhleg0'

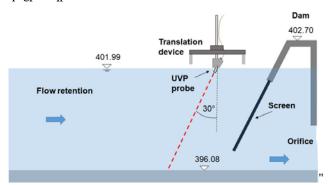
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hqy "o crr kpi "y cu'qdvckpgf "d{ "o qxkpi "yj g"rtqdg"uvgr/d{/uvgr "qxgt"yj g"o gcuwtgo gpv"ctgc. "kp"38"r qkpvu"cpf "5"tqy u0' Tqy u'y gtg"r qukkqpgf "cv"tgur gevkxgn("{ "? "37"o ="{ "? "52"o =" { "? "67"o ="wr uvtgco "htqo "yj g"qtkhleg0'



Hki wtg" 5 <" Wruntgco " xkgy " qh" yj g" f co " uj qy kpi " yj g" WXR" o gcuntgo gpv'uej go g"eqo r qugf "qh'38"r qkpnu'ugv'kp"5"tqy u0"

Vj g"rtqdg"y cu"kpuvcmgf "y kj "cp"cpi rg"qh"52Å"htqo "yj g" xgtvkecn"*Hki wtg"6+0'Vy q"o gcuwtgo gpv'ugtkgu"y gtg"ecttkgf "qww"c0'yj g"j qtk| qpvcn"rtqlgevkqp"qh"yj g"wntcuqpke"dgco "rqkpvgf "wruttgco "cpf "rctcmgn"vq"yj g"ej cppgn"czku."cpf "y gp"d0'vqy ctfu"yj g"i tcxgn"rk/"cpf "rgtrgpf kewct"vq"yj g"ej cppgn"czku0' C"eqo rrgvg" xgmqek/{"o crrkpi "eqwrf"dg"cej kgxgf "wruttgco "htqo "yj g"qtkhkeg."kp"yy q"rgtrgpf kewct" qtkgpvckqpu0'



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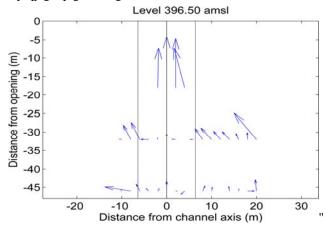
' '%: `ck 'j Y`cVJhmia Udd]b['

Vj g"tgeqtf gf "xgmqek{"f cw"y cu"r quv"r tqeguugf "y kj "vj g" j gm "qh" c" O C VNCD" uwdtqwkpg" {kgrf kpi "vj g" i tcr j kecil' tgr tgugpvckqpu"qh" vj g" hrqy "hkgrf 0' C m" xcnwgu"ctg" j gpeg" eqpukf gtgf "cu"ceeqtf kpi "vq"r tqvqv{r g0'

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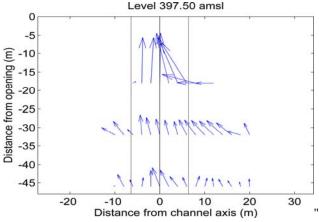
Qxgt"yj g"ej cppgn'dgf "*Hki wtg"7+"hrqy "ku"kpj kdksgf "d{ "yj g" gpeqwpygtgf "dqwpf ct{ "ghigev" {kgrf kpi "c" y gcm' xgrqekv{ "hkgrf 0'Kp"yj g"xkekpkv{ "qh'yj g"dqwqo "qr gpkpi "hrqy "ku'uxtqpi "f wg'vq"eqpvkpwkx{ "tgcej kpi "304"o 1n0'Hrqy "r cwgtp"ku'ergctn("

f ktgevgf 'kp''y g''czku''qh''y g''qtkhleg0'



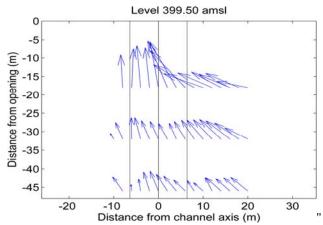
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"r cwgtp"uj qy p"pgct"vj g"ej cppgn'dgf."cv' ngxgn'5; 8072"CO UN0'Dgf "dqwpf ct { "ghtgev'tgf wegu"vj g"xgmqelx{ "lp" vj g" wr untgco "cpcn{ ugf "ej cppgn'r qt\lqp0' P gct" vj g" qr gpl\pi "hqy "\cngu'cp"czlcn'r cyj "qy ctf u'\yj g"qtkhleg0'

Kp"Hki wtg"8."vj g"xgnqek{"hkgrf"cv'ngxgri'5; 9072"COUN"ku" uj qy p0' Vj g" cu{oo gvtkecn' hnqy "rcwgtp" vcngu" rtqi tguukxgn{"rneg"y kvj "vj g"tkug"qh"o gcuwtgo gpv'ngxgr0' Hnqy "rcwgtp"cv' vj g"qtkhkeg"ku"o ckpn{"czkcn" {gv'y kvj "c" i tqy kpi "ncvgtcn'eqo rqpgpv'f wg"vq"hnqy "cttkxkpi "htqo "vj g" i tcxgri'r kv0'



Hki wtg" 8<" Hrqy "xgrqekkgu" uj qy p"cv' rgxgri' 5; 9072" COUN." tgxgcrkpi "vj g"kpetgcug"hrqy "kp"vj g"wrutgco "rctv'qh"vj g"gzco kpgf" ej cppgr0Erqug"vq"vj g"qrgpkpi "hrqy "vcngu"c"ncygtcri'eqo rqpgpv0"

Kp"Hki wtg"9."vjg"xgrqekk{"hkgrf"cv''ngxgrl"5;;072"COUN"ku" uj qyp0'Vjg"gzrgevgf"cu{oogvtkecrlhrqy"rcwgtp"ku"engctn{"fgxgrqrgf"cpf"vjwu"rqkpvgf"qw0'Hqqy"tgockpu"tgrcvkxgn{"uvtqpi"enqug"q'vjg"qtkhkeg."ykj"c"ockp"czkcnleqorqpgpv0'

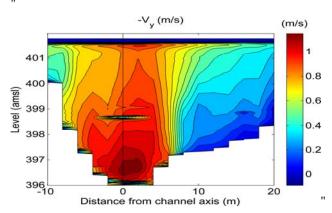


Hki wtg" 9<" Hrqy " xgrqekkgu" uj qy p" cv" rgxgrl 5; 7072" CO UN." tgxgcrkpi ''yj g"gzr gevgf ''cu{ o o gvtkecn'r cwgtp0'

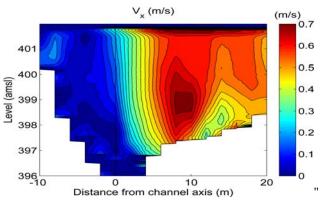
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Ulpeg"yi g"f kuej cti g"rko kxcvkqp"f gxkeg"ku"dwknv"cu"c"dqwqo "qr gplpi "qh"yi g"f co ."yi g"o clp"hqy "vcngu"c"wdg"uj cr g"enqug" vq" yi g" qtkhkeg" cu" uj qy p" kp" Hki wtg": 0' Vj ku" xglp"ej ctcevgtkugf "d{ "xcnwgu"ncti gt"yi cp"302"o lu'ulpmu"htqo "yi g"i tcxgnir kv"Hki wtg"; +"cpf "dgpf u'tki j v'vqy ctf u'yi g"qtkhkeg0'

 $\label{thm:limit} Hmy "xgmek { "tgf we kqp" qdugtxgf "kp" Hki wtg": "*cv"5; : 082" CUO N="qp"ej cppgn'cz kn+"kn" kpf wegf "d { "vj g"j qtk qpvcn'dct" qh'vj g"f tkhv'y qqf 'r tqvge kqp' uetggp0' }$



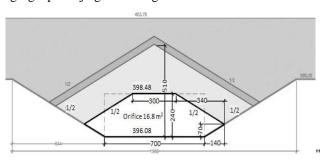
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Hki wtg"; <"Hnqy "o cr "cej kgxgf "qp" yj g"rj {ukecn'o qf gn0'Xgmqekx{" xgevqt" hkgrf ." Xz." r gtr gpf kewnct" vq" yj g" ej cppgn" czku0' Eqtg" xgmqekx{ 'hqwpf 'emug' vq'tceniqh' yj g'i tcxgni'r kx0'

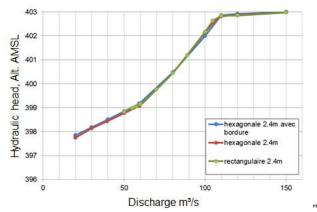
'"&≔adUWhicb h\Ycf]Z]WYBg fUh]b[WifjY"

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Hki wtg"32<"F kuej cti g"rko kskpi "qtkhleg."y ksj "c"; 0 "o "rcti g."406"o " j ki j "j gzci qpcn'dqwqo "qr gpkpi "qh'\j g"f co 0'

Gxgp"yi qwi j "yi g"cu{o o gytkecn'wruntgco "hqy "r cwgtp"o c{" ko r cev" yi g" tcvkpi " ewtxg" qh" yi g" dqwqo " qr gpkpi ." yi g" cpcn{ugu"eqwf "{kgrf "cp"crrtqrtkcvg"qtkhkeg"i gqo gyt {0'Vj g" tcvkpi " ewtxgu" uj qy p" kp" Hki wtg" 33" r qkpv" qw" yi cv" c" j gzci qpcnl" i gqo gyt {" eqwf" dg" eqttgevn{" hkwgf" vq" yi g" f ghkpgf"j {f tcwrke"eqpuntckpw0Vj gtghqtg"c"; 0 "o "rcti g"cpf" 406" o " j ki j " dqwqo " qr gpkpi " eqwrf" dg" cf qr vgf" hqt" eqpuntwevkqp"qp"yi g"Cktg"Tkxgt0'

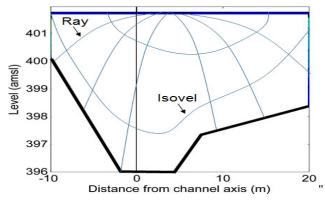


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' " 'G\ YUf glf Ygg 'Udd`]YX cb 'h\ Y``YZhW(UbbY` 'VUb_ '

Cu" f go qpurtcvgf "cdqxg" *Hki wtg" 7" vq" Hki wtg"; +" hqy "gzrcpf u"kpvq"cdwo gpv'qh" yj g"nghv"tkxgt"dcpm'qxgt" yj g"yj qng"y cvgt"eqnwo p."kpf wekpi "uj gct"uvtguu0"K/ku"yj gtghqtg" crrtqrtkcvg" vq" f gvgto kpg" uj gct"uvtguu" cu" c"hwpe wqp" qh" xgmekv{."cu'hqmqy gf"

$$\tau = \rho \left(\frac{U \cdot \kappa}{\ln\left(\frac{l_m}{l_0}\right)} \right)^2$$
 *3+"



Hki wtg"34<'Qtyj qi qpcn"Tc{/Kuqxgn'pgwy qtm'vcngp"kpvq"ceeqwpv'hqt'uj gct'uvtguu'cpcn(uku'kp"vj g'wr uvtgco 'xkekpkk("qh'vj g'qtkheg0"

 $V\{r \ kecn''uj \ gct''uvtguu''xcnwgu''tgcej \ "\tau"\ddot{O}'422"P \ lo \ "pgct''j \ g'' \ ngh''ej \ cppgn''dcpm''wr uvtgco "ltqo "vj \ g''qtkhleg0'Vj ku''xcnwg'' j \ cu''q''dg''uecngf ''wr ''d { "c"3057"o wnkr nlecvkqp''hceqt''f wg''q'' y g'' xgnqekx{ "eqo r qpgpv''pqto cn'' vq'' y g'' ngh''tkxgt''dcpm'' {kgrf kpi "xcnwgu''ncti gt" <math>\tau$ " "492"P lo 0'Vj gug''eqpuvtckpv''tgs wktg''c'tkr/tcr''dcpm''tqygevkqp'']6_0'

''('7cbg/fiWh/X`g/fiWhifYg`cb`h\Y`5]fY`F]jYf''

Cu'f go qpuntcygf "qp"Hki wtg"35."yj g"cpcn(ugu"ecttkgf "qw"cv" yj g"Ncdqtcyqt {"hqt"Crrnkgf "J {ftcwleu"qh'J GRKC"{kgnf gf " yj g"eqpuntwekqp"qh'c"j gzci qpcn'f knej cti g"nko kklpi "qtkhleg" qp"yj g"Cktg"Tkxgt"cu"f ghlpgf "qp"yj g"rj {ukecn'j {ftcwle" o qf gn')Wruntgco "htqo "yj g"qtkhleg"c"tkr/tcr "ej cppgn'dcpm' nkpkpi "y cu'cf qr ygf 0'



Hki wtg"35<"Utwewtgu"eqpurtweygf "qp"yj g"Cktg"Tkxgt"cu"f ghkpgf" qp"yj g"rj {ukecn'j {f tewrke"o qf gr0'C"j gzci qpen'qtkhkeg"cpf "c"tkr/tcr "ej cppgn'dcpm'hkpkpi "y gtg"cf qr ygf "wr urtgco "htqo "yj g"newgt0'

* "Gi a a Ufmi

Vj g"cej kexgo gpvu"qh"vj g"rtgugpv'uvwf {"wpf gtnkpg"vj cv'vj g" crrtqrtkcvg" ej qkeg" qh" uvtwewtch' o gcuwtgu" kp" tkxgt" tguvqtcvkqp"o c{"dg"cuwkuygf"d{"rj {ukech'o qf gnf'vguvu"kp" rctvkewct"y j gp"wpeqo o qp"hqy "rcwgtp"eqpf kkqpu"ctg" gpeqwpygtgf 0'

Kp"yj g"Cktg"Tkxgt"tgxkcrkucvkqp"rtqi tco o g"kp"I gpgxc"yj g" xgqqek{"hkgrf"o crrkpi "qh"cp"cu{o o gvtkecn"hqy "rcwgtp" tgxgcrgf "rgtvkpgpv'qp"rj {ukecn'j {ftcwrke"o qfgn0"

Vj g"gzr gtko gpvcn'uwwf {"ecttkgf "qwv'd {"o gcpu"qhl'c"O gv' Hrqy " WXR" r tqdg" cv' yj g" Ncdqtcvqt {" hqt" Crrrlgf" J {ftcwkeu"qhl'J GRIC"ó"I gpgxc."r qkpvgf "qwv'yj cv'f gur kg" yj g"gpeqwpvgtgf "cu{o o gvtkecn'hrqy "r cwgtp"yj g"j {ftcwkeu"qhl"yj g"qtkheg"qr gpkpi "ku"y gcmn{"chhgevgf 0'[gv."kp" qtf gt"vq"tgur gev'yj g"kpwpf cvkqp"tkum'o kki cvkqp"i qcmu"qhl"yj g''Cktg"Tkxgt"tgxkcrkucvkqp"r tqlgev'yj g"f ko gpukqpu"qhl'yj g"r tqr qugf" j gzcf geko cn' qr gpkpi " j cf " vq" dg" vguvgf " qp" r j {ukecn'o qf gn'cpf "cf lwuvgf 0"

Vj g"uwf {"tguwwu"cnq"r qkpvgf "qw"yi cv"kp"yi g"wr untgco "xkekpkx{"qh"yi g"f kuej cti g"rko kkpi "qtkhkeg."pqvcdrg"uj gct"untguu" ku" cr rkgf "qp" yi g" rghy' tkxgf "dcpm' f wg" yi g"gpeqwpygtgf "cu{o o gvtkecn'vtcpuxgtug"hrqy 0'Vj gug"tguwnu" {kgrf gf "yi g'tg/gxcrwcvqp"qh'yi g"dcpm'r tqygevkqp"ygej pks wg"kpkkcm{"r rcppgf "d{"r rcpv"gpi kpggtkpi 0'Vj gtghqtg."c"tkr/tcr "untwewtg"y cu"gtgevgf "qxgt"yi g"gpvktg"j gki j v'qh'yi g"rghy'dcpm'cu"ej cppgn'hkpkpi 0'

F YZYf YbWYg

]3_"Xgeugtp{2u"\ 0'gv"cn0"Kppqxc\kxg"f tkhvy qqf "tg\gp\kqp"f gx\keg" qp"\yi g"C\kg"T\kxgt"\kp"I gpgxc."Kp\gtr tcgxgpv"Eqpi tguu."N\w| gtp." Uy k\| gt\pf |*4238+"

]4_"Xgeugtp{2'u'\ 0'gv'cn0'Rj {ukecn'o qf gmkpi "qh''vj g"vj ktf "uxei g"qh" Cktg"Tkxgt"tgxkschucvkqp"rtqlgev0'Uy kuu"Eqo r gvgpegu"kp"Tkxgt" Gpi kpggtkpi " cpf " Tguvqtcvkqp." U{orqukwo " EKRE" MQJ U." Uy kkj gtmpf "*4236+"

]5_"Mgcp"I0Y 0'gv'cn0c"Vguv'qh"c"O gyj qf "q"Ecnewrcy"P gct/Dcpm' Xgmqek{" cpf " Dqwpf ct {" Uj gct" Utguu." Iqwtpcn' qh" J {f tcwrle" Gpi kpggtkpi ."CUEG."r r 07: : /823"¾422; +"

]6_"Ej gp"[0J 0'cpf "Eqwqp"I 0MD\"F gulki p"qhl"Tqcf ulkî g"Ej cppgnu" y kıj "Hıgz kdırg"Nkplopi u."J {ftcwrle"Gpi kpggtkpi "Ektewrct"P q0'37" Tgr qtv' P q0' HJ Y C/KR\: 8\/70' Y cuj kpi vqp." F \times Hgf gtcn' J ki j y c{ "Cfo kpkurtcvlqp."WUC"\\$3;: 8\+"

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