

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION 5 77 WEST JACKSON BOULEVARD CHICAGO, IL 60604-3590

Reply to the attention of: \$SR-6J\$

September 24, 2020

Linda B. Albrecht Department of the Army Army Environmental Command ATTN: MAIL STOP 112, IMAE-E 2455 Reynolds Road JBSA Fort Sam Houston, TX 78234-7588

RE: <u>Consistency Test for the Final Fiscal Year 2019 Annual Performance Report</u>, New Brighton/Arden Hills Superfund Site, Arden Hills, Minnesota

Dear Ms. Albrecht:

The U.S. Environmental Protection Agency and the Minnesota Pollution Control Agency have completed review of the subject *Final Fiscal Year 2019 Annual Performance Report, New Brighton/Arden Hills Superfund Site, Arden Hills, Minnesota* (FY2019 APR). Based upon our review, the FY2019 APR is acceptable.

In accordance with Chapter XIV of the TCAAP Federal Facility Agreement, the Final FY2019 APR passes the Consistency Test.

If you have any questions please contact Tom Barounis (312-353-5577, barounis.thomas@epa.gov) or Brigitte Hay (651-757-2497, Brigitte.hay@state.mn.us).

Sincerely,

9/24/2020

9/24/2020

Tom Barounis

Tom Barounis

Signed by: THOMAS BAROUNIS Remedial Project Manager U.S. EPA Region 5 Tom Barounis

Signed by: THOMAS BAROUNIS for Brigitte Hay Project Manager Remediation Division Minnesota Pollution Control Agency

Tom Barounis



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#### ØÒJÔOĚÁŸÒOĖJÁŒEJÁŒÞ₩OĚÁÚÒÜØUÜT Œ₽ÔÒÁÜÒÚUÜVÁ

- F€ËIÁ Ó ˘ååąੈ \* ÁF€GÊÁW}ãa∕FÉ&ãa°Ë FÊGËÖ3&@{{ ¦[^c@}}^ÁÜ^• ĭ |œÉÂŬ `{ { ^¦ÁG€FJ
- FۃÍÁ Ó ĭ a‡å āj \* ÁF€GÊÁN} ãaÁFÊ£Xāj ^ | ÁÔ@{[ ¦ãå ^ ÁÜ ^ ĭ | o• ÊÂŬ ĭ { { ^ ¦ ÁG€FJ
- FFËFÁ UWGÁCE čæráð ÁÚãe () |ðj \* ÁŠ[&æráf]}•
- FGËFÁ VÕÜÙÁŠæĉ [č dÂU] ^¦æà|^ÁW}ãÁG
- FGËGÁ VÕÜÙÁØŸGEFJÁ/[œ¢ÁÖæáj^ÁØ[, ÁÜæz^•ÉAJ]^¦æà|^ÁV};ãÁG
- FGËHÁ VÕÜÙÁ/¦^æa{ ^} αÂÙ^• ơ^{ ÁÚ^¦-{ | { æ} &^ ÊÁU] ^|æà|^ÁN} ãớG
- FGÉÍÁ VÕÜÙÁQE;} ča¢ÁT[}ãu[¦ãj\*ÁÖaaeaaÁ.ÁY ^•oÁÚ[¦cãj}ÊÉFÉİÉÖãj¢aa)^ÁÔ[}&^}daeaãj} •ÁRť}^ÁO€FJÉÁU]^¦æà|^ W}ãa∕ÁGÁ
- FGÊÎÁ UWGÊÂW]]^\Áse)åÁS[,^\ÁV}ãuÁHÔ[{àã}^åÊÁ\ä&@2||[\^c@2}^Áse)åÁFÊLËÖã[¢æ3)^Á@2[&[}&^}dæaã[}ÁTæ3]Ê Ù`{{^\ÁGEFJÁ
- FGËIÁ UWGÊÁW]]^\'ÁW}ãÁ ÉÁV¦ã&@[[¦[^c@}}^Áæ)åÁrÊIËÖã[¢æ)>Á@[&[}&^}dœaã[}ÁTæ]ÊÂŬ`{{^\'ÁG€FJ
- FGĖIÁ UWGĖŽŠ[, ^¦ÁN}ãÁ ĖŹV¦&3&@[;¦[^c@}}^Áæ)åÁrĒIĖÖjā[¢æ)>Á@[&[}&^}dæaā[}ÁTæ]ĚÂŬ`{{^¦ÁG€FJ
- FHËFÁ Ùãc^ÁÚ|æ) ÉÃU] ^¦æà|^ÁW} ãóÁH

### 5 DD9 B8 **=**7 9 G

- OE[]^}åã¢ÁŒÁ ØŸÁG€FJÁ.ÁØŸÁG€GHÁT[}ã{[¦ã]\*ÁÚ|æ}∙Á
  - OBÈÉÁÁ Õ¦[č}å, æe^¦ÁT[}ãq[¦ā);\*ÁY^∥∙

  - O⊞ÌHÁÁ Ùĭ¦~æ&∿ÁYæe∿¦
  - OHÈ ÁÁ Ùã~ÁÙ]^&ãã&ÁŠã;⊙Á, ÁÜ^˘˘ã^åÁOB; 榈c∿●
  - OHĚÁÁ Þ^, ÁÓ¦ãt@{[}ÁU]^¦æaãj\*ÁÜæe^∙
- OEJ]^}åã¢ÁÓÁ T[}ãã[¦ã]\*ÁY^∥ÁQ)å^¢
- CE[]^}åã¢ÁÔÁ ÖæææÁÔ[||^&&ãį}ÊĂTæ)æ\*^{ ^}œ£a)áÁ∪¦^•^}œæãį} ÔÈEÁÁ ÖæææÁÔ[||^&&ãį}ÊATæ)æ\*^{ ^}dÊæb}åÁ∪¦^•^}œæãį} ÔÈEÁÁ Ö^çãææãį}•Á¦[{ÁT[}ãt[¦ã]\*Á∪¦[\*¦æ4 ÔÈEVÁÁ Ü^\*\*|æε[¦^ÁOE]]¦[çæ4•Áį-ÁÖæææÁ∿•æàããcâÁ∪^][¦o•
- OĘ]]^}åã¢ÁÖÁ Ô[{]¦^@}•ãç^ÁÕ¦[`}å, æe^¦ÁÛ`æ¢ãĉ Áæ)åÁÕ¦[`}å, æe^¦ÁŠ^ç^|ÁÖæææàæe^ ÖÈEÁÁ Ô[{]¦^@}•ãç^ÁÕ¦[`}å, æe^¦ÁÛ`æ¢ãĉ Áæ)åÁÕ¦[`}å, æe^¦ÁŠ^ç^|ÁÖæææàæe^• ÖÈEÁÁ U]^¦æà|^ÁW}ã/FÁÙææãæa&æ4ÁQ5;憰eã ÖÈEÈEÁY^||ÁÕ¦[`]Áæ)åÁÙææãœ&æ4ÁQçæ{\*ææã[}ÁÔ¦ãe^¦ãæÁ/æà|^•

Ö ÈÐÈCÁÕ¦[ĭ] ÁFÉÆGÉÁHÉÁ É&ee)åÂiÁTæ)}ËS^}åæ|ÁÒçæ¢ĭææã[}●

 $\ddot{O}\dot{E}\dot{E}\dot{H}\dot{A}\ddot{O}|[\,\check{}\,]\dot{A}\dot{A}\dot{P}^{\,\,\dot{}}\dot{A}\dot{O}|\ddot{a}\,@[\,]\dot{A}\dot{I}\,\check{}\,\check{}\,\dot{A}\dot{O}|\ddot{a}\,@[\,]\dot{A}\dot{I}\,\check{}\,\dot{A}\dot{O}|\ddot{a}\,@[\,]\dot{A}\dot{I}\,\check{}\,\dot{A}\dot{O}|\ddot{a}\,@[\,]\dot{A}\dot{I}\,\check{}\,\dot{A}\dot{O}|\ddot{a}\,@[\,]\dot{A}\dot{I}\,\check{}\,\dot{A}\dot{O}|\ddot{a}\,@[\,]\dot{A}\dot{I}\,\check{}\,\dot{A}\dot{O}|\ddot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\&\dot{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\&\dot{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\&\dot{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\&\dot{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\&\dot{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\dot{I}\,\check{A}\dot{O}|\dot{a}\,@[\,]\dot{A}\dot{I}\,\check{A}\,\check{A}\dot{I}\,\check{A}\,\check{A}\dot{I}\,\check{A}\,$ 

- OE[]^}åã¢ÁÔÁ Y^∥ÁQ;ç^}d[¦^
- CE;]^}åã;cÁÐÁ CE;}čæ;4ÂĴã;cÁQ,●]^&cā;}ÁÔ@∘&\|ã;cÁ{;¦ÁŠæ;}åÁ№^ÁÔ[}d[|•
- CE[]^}åā;kÁŐÁ Ő¦[`}å, عدد الْجَارَة اللَّهِ اللَّهِ اللَّهِ اللَّهِ اللَّهِ اللَّهِ اللَّهُ الْمَعَ الْمَعَ ال Ú¦[b%sddžÓæć ÁY ^•džGEFJÁ
- CEŢ]^}åã; ÁPÁ Ùã:^ÁSÁ⇔) åÁ/ÕÜÙÁU]^¦æzā[}æ¢lÖæzæÁ PÈFÁÁ Q,•]^&cā[}Á⇔) åÁTæ3jc?}æ) &^ÁOBScā;ãã?•Ék2ã; &æ¢ÁŸ^æÁQEFJÉAÙã:^ÁSÉAUWG PÈGÁÁ Tæ3jc?}æ) &^ÁOBScā;ãã?•Ék2ã; &æ¢ÁŸ^æÁQEFJÉAVÕÜÙÉAUWG PÈHÁÁ Tæ3jc?}æ) &^ÁOBScā;ãã?•Ásî^ÁS[&æzā]}Ék2ã; &æ¢ÁŸ^æÁQEFJÉAVÕÜÙÉAUWG CE[]^}åã; ÁQÁ VÕÜÙÁÔ@{ &&æ¢ÁÖæzæ
- OEJ]^}åã¢ÁQÁ VÕÜÙÁÔ@{ã&a‡4Öæææ OEFÁÁ VÕÜÙÁÔ¢dæ&ca‡}ÁY^∥∙ÁÁ¦ã&@[¦[^c@}}^Áş•ÈÁVãţ^Á OEGÁÁ Ql-|`^}oBOÒ→|`^}ơЮæææàæe^É62ãã&aa‡ÁŸ^æáÁGEFJÉÉVÕÜÙÉÁJWGÁ
- $O[]]^{\delta} a \tilde{a} c A \tilde{R} A T a e [\bullet A \tilde{O}^{\delta} \delta \tilde{a} \tilde{a}] A T a e e \tilde{a} c A$

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ŒŰÜÁ	Œ;}čæļÁŰ^¦-[¦{æ}&^ÁÜ^][¦cÁ
ŒIJÁ	æåçæ) &^åÁ (¢ããææa) } Á
OÐUÚÁ	æåçæ)&^åĄ́k¢ãåææāį}Á́i[ơ^}œãekÁ
CEE{ ^Á	₩}ãe^åÁĴcæe^•ÁŒ{ ^Á
CEÙÁ	æãÁ]æ*ð;*Á
Óæ¦Á	Óæ¦ÁÒ} * āj ^^¦āj * Á
ÔÒÜÔŠŒÁ	Ô[{]¦^@}•ãç^ÁÒ}çã[}{ ^}œa‡ÁÜ^•][}•^ÊŹÔ[{]^}•æaā;}ÅŹŠãæaàããã ÁOE8oÁ
&ã ËFÊ∃ËÖÔÒÁ	&ã Ё=ÊĴËäã&@[¦[^c@}}^Á
ÔUÔ•Á	&[}•cãč ^} œÁ[-Á&[}&^\}Á
ÔÜŒÁ	Ô[}^•q[*æÜ[ç^¦•ÁBÁŒ•[&ãæe^•Ê&Q&ĚQ;[,ÁÕPÖDÁ
ÒÓÙÁ	Ò}çã[}{ ^}œ‡ÁÓæ•^ ðj^ÁÙ*¦ç^^Á
ÒÙÖÁ	Ò¢] æ)æaā[}Á[-ÁÙā*}ãa8æ)ơЮã-^¦^}&^Á
ÒY Á	^¢dæ&aąį}∮_^ ^  Á
ØØ05Á	Ø^å^¦æ¢ÁØæ&ãããćÁOE°¦^^{ ^} oÁ
ØÙÁ	∽æ•āàājāĉÁcčå^Á
ØŸÁ	~ã&æ‡Á^æłÁ
ÕŒÛÁ	*¦æ)ĭ ælÁæ£cã;æe^åÁ&æàà[}Á
ÕUÙÁ	VÕÜÙÁÕ∥[àæ‡ÁU]^¦ææ∄*ÁÙdæe∿*^Á
*]{ Á	*æļ[}•Á^¦Á ā, čA
PÜŠÁ	P^æ¢c@ÁÜãr∖ÁŠãįão•Á
RXÁ	ÚCS:CEÁCE:&æåãrÁ/NÈUÈÉAQ:&É&æÁR[ā]oÁX^}č¦^Á
ŠÕŒĐÁ	ã ĭãåÁj @æ•^Át¦æ)ĭ ælÁæ&cãçæe∿åÁ&æàà[}Á
ŠWÔÁ	æ);åÁ́∙^Á&[}d[ Á
ŠWÔÜÖÁ	æ);åÁ•^Á&[}d[ Á^{ ^åãædy&a^•ãt}Á
T ÔŠÁ	{ æ¢āį ǐ{ Á&[}œa; ājæ)o4/^ç^ Á
ΤÖΡÁ	Tā]}^•[æ#Ö^]ælq(^}on[, -ÅP^æpc@Á
TÞOEÁ	{[}ãī[¦^åÁjæč¦æþÁæcc^}čæã]}Á
TUÙÁ	VÕÜÙÁTa‰[ÁJ]^¦ææðj*ÁÙdææ^*^Á
ΤÞŒÜÞÕÁ	Tậ}}^•[œa40E{ ^Áp-æaậ[}æa4Ã

### Á Ø©ÙÔŒŠÄŸÒŒÜÁG€FJÁŒÞÞ₩ŒŠÁÚÒÜØUÜTŒÞÔÒÁÜÒÚUÜVÁ

t úôœá	Tậ}}^•[cæÁÚ[  čaậ}}ÁÔ[}d[ ÁOE^^}&`Á
ΤΥÁ	{ [ } ãť[ ¦āj * Ḁ́ ^  Á
ÞÓÐDEPÁ	Þ^,ÁÓ ¦āt@q[}B00Eå^}ÁPā∥●Á
ÞÓÔÕÜÙÁ	Þ^,ÁÓ¦āť@q[}ÁÔ[}æa∉ājæe^åÁÕ¦[`}å,æe^¦ÁÜ^&[ç^¦^ÁÛ^∙ơ\{Á
ÞÓT Á	Þ^, ÁÓ ¦āt@a[}ÁT`}a&a];æ‡Á
UÙÁ	VÕÜÙÁJ]^¦æaðj*ÁÙdæa**^Á
UWÁ	U]^¦æà ^Á/\}ãtÁ
UWFÁ	U]^¦æà ^ÁW}ãóÆÁ
UWGÁ	U]^¦æà ^ÁW}ã¢GÁ
UWHÁÁ	U]^¦æà ^ÁW}ãóÁtÁ
UWFVÕÁ	UWFÁ/^&@;38æ‡4Ő¦[č]Á
ÚÔÒÁ	c^dæ&@[¦[^c@}}^Á
ÚÕŒÛÁ	]^¦{ æ}^}o^{{\!\!\!\!\!\!\!}^{}}` ælÁæ&cãçæe^åÁ&æà[}Á
ÚÕÜÙÁ	Ú `{^ÁÕ` [`}å, æe^\ÁÜ^&[ç^\^ÂÙ^•ơ^{ Á
ÚT Á	]¦^ç^}cææäç^Á(æäjc^}æ)&^Á
ÚUVY Á	Úٽà a& ↑ЁU、}^åÁV¦^æe{ ^}ơÁY[¦∖∙Á
ÚVOEÁ	Ú¦ā[^¦ÐV¦æ&^¦ÁŒL^æÁ
ÛŒŰÚÁ	Ûča¢ãĉÁŒ•č¦a≱&∧ÁÚ¦[b∿&oÁÚ a≱Á
ÜUÖÁ	Ü^&[¦å/﴿, 4Ô/8æٓ;ą̃]}Á
ÜÚZÁ	¦^å` &^åÁ¦^•••` ¦^Á[}^Á
Ù@æçÁ	Ù@æç ÁÒ}çã[}{^}œa‡ÁBÁQ:-¦æe:dč&cč¦^ÊÁQ;&ÈÁÇ[¦{^¦ ^ÁÙq[}^ÁBÁY^à∙c^\¦DÁ
Ùã:^Á	Ó ¦ãt @q[} HDEEå^} ÁP āļ ● ÁÙĭ] ^ ¦ ~`} å ÁÙãe^ Á
ÙÜŒ20ÙÁ	Ùٽ]] ^{ ^} œa‡ÁÜ^{ ^åãa‡ÁQ;ç^∙cã æaãį}Áæ)åÁ⁄Ø^æ-ãàãjãã ÁÙčå^Á
ÙXÒÁ	•[āļÁşæa][¦Á^¢dæ&aā]}Á
ùy Óôœá	•]^&ãæ‡Á,^  Áã[¦ð]*Áæ)åÁ&[}•d`&cð[}Áæ4^æÁ
ùy ôœá	•]^&ãæ‡Á,^  Á&[}•d`&ãą[}Áæ±^æÁ
VÔŒÐÚÁ	V,ā),ÁÔãa2N•ÁOE{ ^ÁOE{ { `}}ãaā]}ÁÚ aa),cÁ
VÔÒÁ	da&@[[  [ ^o@}}^Á
VÕÜÙÁ	VÔŒEĽÍÃŨ¦[˘}å, æe∿¦ÁÜ^&[ç^¦ˆÂĴ^∙ơ\{ Á
WÙŒÔPÚÚT Á	₩}ã&^åÁÙcææ^•ÁŒ{ ^ÁÔ^}♂\Á{¦Á₽^≈¢d@ÁÚ¦[{[cāį}}Áæ}åÁÚ¦^ç^}cãç^ÁT^åã&a}^Á
WÙÒÚŒÁ	W}ãe^åÂÛcæe^•ÂÔ}çã[}{ ^}œa¤ÁÚ¦[c^&cãį}ÁO≌^}&^Á

### Á Ø©ÙÔŒŠÄŸÒŒÜÁG€FJÁŒÞÞ₩ŒŠÁÚÒÜØUÜTŒÞÔÒÁÜÒÚUÜVÁ

 WÙQY ÙÁ
 W) ãr å ÁÙ cær • ÁQã @ Ár ájå jã ^ ÁÙ ^ lç ãr Á

 XUÔÁ
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# 1Á 9L97IH=J9<sup>·</sup>GIAA5FM<sup>·</sup>

V@ā ÁØā &æ‡Ä?^æłÁgöŸDÁGEFJÁŒ;}`æ‡ÁÚ^¦-[¦{æ} &^ÁÜ^][¦AÁgŒEÚÜDÁ`{{ æiã ^•Áx@ Á cæč •Á; Á^{ ^å^Á ã[]|^{ ^} cæaā]}Êbeaj å Áeaå å ¦^••^•Á@, Áx@ Á^{ ^åã •Áed^A; ^¦-[¦{ ā} \*ÉA[¦Á cæ&@á; Áx@ Áx@^^ A;]^¦æà |^Á }ão Á ¦^|ææ^å Ág[Áx@ Á=>, ÁO¦ā\*@[}EDEtå^}A?a]•ÁQ=DÁDEDÁÙ`]^¦~`}å ÁÙãz^ÈdØā\*`¦^ÁOEFJÁ@, •Áx@ Áea]]¦[¢ā] æz^Á [[&æaāā]}•Á; Áx@ Áx@^^Á;]^¦æà |^Á }ão ÁQU № DĚA/@ã ÁOEÚÜÁ&[ç^!•ÁØŸÁGEFJÁQU&{jà^¦ÁFÉAGEFÌÁ@[`\*@Á Ù^]c^{ à^¦Á HEÉAGEFJDĚADEAČA; Ë^æÁ^çã, Á; æa Áedpe[Á&[{]|^c\*å ÁsjÁØŸÁGEFJÁQDæ;•[}ÁGEFJDĎÁ

Ü^&[¦å•Á;ÁÖ^&ã;ð]}ÁÇÜUÖ•DÁ@æç;^Áà^^}Á;ð}^åÁ{[¦Áræ&@{t,Ár@?Ár@^^ÁJW+KÁ

- •Á UWFÁÜUÖÁ ã } ^åÁFJJHLÁQĘ ^}å^åÁGEEÎÁQÀFDLÁÒ¢] |æ)æaā[} •Á[-ÁÛã] ãaBæ) dŐã-^\^} & ^ÅQDÙÖDÁ ã } ^åÁ§ Á G€G€ÁQÀFDÁ
- •Á UWHÁÜUÖÁÁãť}^åÁFJJGLÁOĘ^}å^åÁG∈∈ĨÁÇÀFDÁ

V@ÁÜUÖ•ÉðæjåÁ`à•^``^}ơÁQĘ ^}å{ ^}orÁæjåÁÒÙÖ•Éðj¦^•^}ơÁs@Á(æbj¦Á&[{][}^}orÁjÁ@ÁðjæþÁ^{ ^åðr•Á -{¦Ás@Á(^åãæd{(-^&[}&^)}ÈV@ðrÁ^][¦ơ4[[\•Ásæá\*æ&@4(-Ás@Á(æbj¦Á&[{][}^}orÁæ)åÁsæåå¦^••^•kÁ

FĚÁ CE^Ás@\*Á^{ ^å&\*•Ás^ā;\*Ás[ ] |^{ ^} c^åÑÁQĈ[ { ] |ãa;) &^Á&@ & Á ã@ s@ ÁÜUÖ\*Ás;) åÄÜUÖÁCE; ^} å{ ^} o DÁ

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- •Á Ù@eqh[, ÂÙ[ ậÂUãev•KáÞ[ Áseskañçãñað•Án c@:\Ás@eq)Án }\*[ ā] \* ÁW}ãevåÂUceev•ÁCE{ ^ÁQCE{ ^DÁna ] |^{ ^} Asexânçãñað•Án c@:\Ás@eq)Án }\*[ ā] \* ÁW}ãevåÂÚceev•ÁCE{ ^ÁQCE{ ^DÁna ] |^{ ^} Asexânçãñað•Án c@:\Ás@eq)Án }\*[ ā] \* ÁW}ãevåÂÚceev•ÁCE{ ^ÁQCE{ ^DÁna ] |^{ ^} Asexânçãñað•Án c@:\Ás@eq)Án }\*[ ā] \* ÁW}ãevåÂÚceev•ÁCE{ ^ÁQCE{ ^DÁna ] |^{ ^} Asexânçãñað•Án c@:\Ás@eq)Án }\*[ ā] \* ÁW}ãevåÂÚceev•ÁCE{ ^ÁQCE{ ^DÁna ] |^{ ^} Asexânçãñað•Án c@:\Ás@eq)Án }\*[ ā] \* ÁW}ãevåÂÚceev•ÁCE{ ^ÁQCE{ ^DÁna ] |^{ ^} Asexânçãñað•Án c@:\Ás@eq)Án }\*[ ā] \* ÁW
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- A V@Á/ÕÜÙÁ;]^¦æe^åÁxee/áxě -38a?}óA;[A`]][¦óA@óA;]&[`+ā;]&(``eā;]Å;@eecá@ÁUWGÁ,Á;\*EŠÁ/ÔÒÁ;`';&A` æh?æÁ;[d];a;dia ábæ;Á@å;aë |38æa;h´á; +``}&^àÅa^]^&a;a^;^Á; -Ás@ÁFJJÏÁUWGÁUÜÖÈQ;Á@`FJÊb@Á;[æa;A ^¢dæ&aā;}Á;^||Á;æe?;Á;`{]^åÁxeç^;a\*^åÁFÊÏHA\*;æa;[}+Á;A;ā;čcAÇ]{DÊ;@38&@A¢&^^å+Ás@A ^¢dæ&aā;}Á;Au]a;ech`A;`{]^åÁxeç^;a\*^åáFÊÏHA\*;æa;[]}+Á;A;A;ā;čcAÇ]{DÊ;@38&@A¢&^^å+Ás@A Õ|[àæa;AJ]^;æaā;\*ÁUdæe^\*^ÁU]^;æaā;\*ÁTā;ā;č{AÇFÊLIÁ;}DĚÁ
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#### <u>CdYfUV`Y`Ib]h'`fCI'Ł</u>Á

#### <u>Ch Yf = bj Ygh][Uh]cb UbX#cf F Ya YX]Uh]cb 5 Wh]j ]h]Yg BchDf YgW]VYX VmU7 i ff YbhF C8</u>

 T ÚÔCEÉæj å Ás@ ÁCE{  $\dot{E}$ /@ Á à b & cāç ^ Á Á  $\dot{A}$  ( $\dot{A}$ ,  $\dot{A}$ 

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# 2Á ·BHFC8I7H-CB

### &"% Di fdcgY"

- •Á UWFÁÜUÖÁ ã } ^å/ÁFJJHLÁQĘ ^} å ^å/å ÁÐEEÎ ÁÇÀFDLÁÖ¢] |æ) æzāţ } •Áţ -ÁÙãt } ãæðæ) ofÖã-^¦^} & ^ÅÇDÙÖDÁ ã } ^å/ÅŞ Á GEGEÁÇÀFDÁ
- •Á UWHÁÜUÖÁÁãť}^åÁFJJGLÁOĘ^}å^åÁG⊖⊖€ÎÁQÀFDÁ

 $V @ A U U \ddot{O} \bullet E \dot{A} \ \dot{a} \bullet \wedge^{\times} \ A \dot{O} \dot{C} \ \dot{A} \$ 

1. Are all of the remedies being implemented? (Compliance check with the RODs)

2. Are the remedies performing as required?

2[ الأَحْظَى هَلْ اللَّفَاقَةِ مُلَكَ اللَّانَ الْحَجَى الْمُ الْمُوْلَمَ مَعْلَى الْحَجَى الْمُحَدَى الْ • ^ إِنْ هُذَا الْمُحْمَعُ مُعْلَى الْمَحْمَةُ مُعْلَى الْمَحْمَةُ مُحَدَى مَعْلَى الْمُحَدَى الْمُحَدَى الْمُ المُعْرَبَةُ اللَّهُ مَعْلَى اللَّهُ مَعْلَى الْمُحَدَى اللَّهُ مَعْلَى الْمُحَدَى الْمُحَدَى الْمُحَدَى الْمُ المُعْرَبَةُ اللَّهُ مَعْلَى اللَّهُ مَعْلَى الْمُحَدَى الْمُحَدَى الْمُحَدَى الْمُحَدَى الْمُحَدَى الْمُحَدى الْمُحَدَى الْمُحَدى الْمُحَدى الْمُعَلَى الْمُحَدى الْمُحَدَى الْمُحَدى الْعَلَى مَعْلَى الْمُحَدى الْمُعْلَى مَالَى الْحَدَى الْمُحَدى الْمُحَدى الْمُحَدى الْمُحَدى الْمُحَدى الْمُعْلَى مَالَى الْحَدى الْحَدى الْمُحْلَى الْحَدى الْمُعْل عَدْمَا مَعْلَى مَالَى مَالَكَ مَعْلَى الْمُعْلَى الْمُعْلَى مَالَى الْحَدى الْحَدى الْحَدى الْحَدى الْحَدى الْمُعْلَى الْحَدى ال عَدْمَا مَعْلَى الْحَدَى الْحَدَى الْحَدَى الْحَدى الْ عَدَى مَا مَعْلَى الْحَدى ا عَدَى مَا مَالَكَ مَالِكَ مَالِي مَاحَدى الْحَدى الْحَدى الْحَدى الْحَدى الْحَدى الْحَدى الْحَدى الْحَدى الْحَدى الْحَ

Q Ásesááãā) } Át[Á^] [¦cā] \* Át] ÁØŸÁGEFJÉA, ![] [•^åÁ×č¦^Át [}ãt[¦ā] \* Ásē Áse‡+ [Á, ¦^+^} c^åÁ<mark>çCH, ]^} áã;ÁOHDÉ</mark>A, ão@Á ]¦[] [•^åÁ&@ea) \*^+ÁsjÁt [}ãt[¦ā] \* Át[&ææā] }•Áse) åÁt, !Áæξ] |ā] \* Á¦^~ `^} &&a • Á@ã @eã @eå ášsjÁ^||[, ÈAT [}ãt[¦ā] \* Á &[ç^¦+ÁseÁ[||ā] \* Á Ë ^æáÁsā[^Á] æ) Ágã≥ ÈÉ&&` ¦!^} d^ ÁØŸÁGEFJÁs@[`\* @skØŸÁGEGHÁ, @e¦^Áso@ Á, ^¢cÁ ^æáÁØŸÁGEFJÁ , āļÁs¦[]Át, ~Áse) åÁØŸÁGEGIÁ, āļÁs^Áseáå ^åDĚÁ

# &"& 6 f]YZCj Yfj]Yk 'cZH7 5 5 D'

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$$\begin{split} \dot{U}^{c} + \frac{i}{2} & \dot{A} = \frac{i}{2}$$

## &" <mXfc[Yc`c[]Wlb]hg`UbX`KY``BcaYbWUhifY`

Q[ ¦Á, ` ¦] [ • ^ • Á; Á č å ð • Á æj å Á, [ ¦\ Á ^ | æ č å Á tá Á @ Á Ù ã c É A [ ` ¦ Á @ å | [ \* ^ [ || \* 38 Á } ão Á @ æ ç ^ Á a ^ } Å å • ð ť } æ č å h Á V} ã Á FÁÇ@ Á čl ãa | ^ Á Q[ ¦ { æ tā } DĚ V v ã Á Á Ç @ Á V ā Å Á G & A (] ¦ { æ tā } DĚ V v ã Á Á Ç @ Á ? a | • ã ~ Á D æ å | æ á } a É & e č å h Á V ã Á Ú | æ tā ð Å X Á Ø @ A (] ¦ a æaj } DÉ A V a A Á Q & A (] { a ætā } DÉ A V a A Á G & A (] & a a A () a a É & e ta a A () a a A Á Q & A () Ú | æ tā ð Å X Á Ø @ A (] ¦ a æaj A (] ¦ a æaj } DÉ & A () a æaj } A () & A () ç @38.@4,ā|Á@31:@43:@43:@4&:^•ā/å4,^||Á,æ{; ^4(;}Á@:A31`;^À50E;æaājaæi|^Á54;-[;{ ææāt;}Á64[}&^;}ā, A64; ^||É54;&]\*Á , ^||Á[\*•Áæ);åÁ[:c@:¦Á8j-{;{ ææāt;}É54&æ);Áa^Áça?, ^åÁ9;Ác@:Á0E;]^}åã¢ÁÓÁ(CEccæ&@; ^}cE3; @38.@4æiA\*[;|c^å/áa^Áx@A Tā;}^•[cæá';}ã`^Á,`{ à^;EÈÙ^^Á5j•d`&cāt;}•Á5jÁCE;]^}åã¢ÁÓÁ{;¦Á;[;!^Á9j-{;{ ææāt;}ÈĂ

### &"( 8 UHJ7 c``YWFjcbžA UbU[ Ya YbhžUbX'Df YgYbHUFjcb'

#### 5 fY'N, Y'XUHU'Wea d`YNY'UbX'fYdfYgYbHUhjjY'fUfY'k Y'a U\_]b['XYW]g]cbg'VUgYX'cb'Wea d`YNY'UbX' NYW{b]WU`migci bX']bZefa UhjcbH3'

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Ü^\*ælåði \* Á&[{]|^c/}~••EÅQE]]^}åærÁÔÈSÁ`{{ælã^+áb}^karce a sentral beform a sentral befor

Ü^\*ælåðj\*Á`æláč Á&[}d[|Á;æl]|^•Ébo@ ÁÛ ŒÚÚÁ]^&ãæ?•Á&\*|å/&`]|&Bæær^•ÉA``ð]{ ^}oÁðj•^Áa|æ)\•Ében)åÁ {ælácÁ]ði^Ð;ælácÁ]ði^A&`]|&Bæær•Áæl^Álf Áa^Á&[||^&cråÁæAlf,ç^!æl|Á!^``^}&&ð\*•Át,ÁF€Ã Ében)åÁ à Á !^•]^&cáç^|^ÈKOBBC`ælÁ`æláč Á&[}d[|Á:æl]|^Á!^``^}&&ð\*•Át,^oÁs@e^Át[æl+ÉÅ,ãc@Ás@ Ár¢&^]caf}Af,Á\*``ð]{ ^}oÁ !ðj•^Áa|æn}\•ÉÅ,ãc@Ár•]^&cáç^Á!^``^}&&ð\*•Át,ÁFà ÉbFFà Áæn)åÅ Ã ÈÁ

Yão GÁ^\*ada Áti Ásazazáçadaña azañi}Étxo@Aj^¦-{¦{ a) &^Á; [}ãti¦ãj\*ÁÛO EÚÚÁ]^&ãã e Ásazazáçadaña azañi}Ás^Á &[{]|^c\*a Ásazázaj Ajç^¦ad|Áaze^Aji-ÁF€ÃÉAjão GÁF€€ÃÁçadaña azañi}Ájá ÁFÊEËã ñi¢ad)^Ásazazázaj a Á, ^||Ánjç^}q[¦^Á •azi]|^•EA/@ÁsaSc`ad-Áçadaña azañi}Áaze^Áti¦Áç[|azañ^Áçi!\*ad)ãSAAS[{][`}å•ÁÇXUÔ•DÁaz Á\*¢&^^a^åÁF€ÃÉazaj à Ásde|Á

#### Á ةUÔŒŠÁŸÒŒÜÁGEFJÁŒÞÞWŒŠÁÚÒÜØUÜTŒÞÔÒÁÜÒÚUÜVÁ

åæææÁ^ོʿãð) \* Á≂€€Ã Ásaææáçæ¢ña ææñ[}Á, ^¦^Áč∥^Áçæ¢ña æe^åÊ4( ^^c3) \* Ás@^Á] ^&ãð\*åÁçæ¢ña ææñ[}Áæe^•Á[¦Á ]^¦-[¦{ æ}) &^Á[[}ña[¦ð] \* ÈÁ

Á

# 3Á CD9F56 @9'I B+H'%'899D'; FCI B8K5H9F'

V@\ÁFJJHÁUWFÁÜUÖÁ, æe Áæ; ^}å^åAşiÁO∈€ÎÁ;[Á[¦{ æ¢ã^Áæå[]cā[}Á[-Á';[ĭ}å, æe^¦Á ĭæ¢ãî Árcææãrcã&æ¢Á æ)æf•ã ÈÁÚ¦ã[æc^Á\*|^{ ^}orÁ[-Ás@AFJJHÁUWFÁÜUÖÁse^Áæe Á{ ||[, •ÁÇæ; ^}å{ ^}o%s@æ)\*^•ÁşiÁãæaåãe DAÁ

- FĚÁ Ú¦[çããð] \* Áse¢c^¦} æe^Á, æe^¦Ár`]] |ði•Át[Á^•ãå^} o•Á, ão@Á,¦ãçæe^Á, ^||•Á, ão@3,Ás@A+p[¦c@ÁÚ|`{ ^ÈÁ
- HĂ Extracting groundwater from the North Plume using the New Brighton Contaminated Groundwater Recovery SystemÁpÓÔÕÜÙDĂ`àb 80Át Á@Át II[, ] \* KÁ
  - ÀbÓÔÖÜÙÁ } ا\مُعَقَدَة (A) فَعَتْ مَعْ اللَّهُ فَعَنْ اللَّهُ فَعَنْ اللَّهُ فَعَامَ الْمَعْمَةِ (A) فَعَتْ الْ يَعْدُ اللَّهُ فَعَنْ اللَّهُ عَنْ اللَّهُ عَنْ اللَّهُ عَنْ اللَّهُ فَعَامَ اللَّهُ عَنْ اللَّهُ عَنْ اللَّهُ فَ المَا اللَّهُ عَنْ اللَّهُ عَنْ اللَّهُ عَنْ اللَّهُ عَنْ اللَّهُ عَنْ اللَّهُ عَنْ اللَّهُ عَنْ اللَّهُ عَنْ ا
  - à ÈÁ ~ č ¦^/áb,^&;^æ-^• Áb, Áo@ Áseť \* ¦^\* æe^ Ár¢ dæstañ;}Á æe^ Á, ñajkár Ása^ A'; { ð, ^ å Ásr Ás@ ÁOE{ ^ ÉÉWÙ O Ú O EÉseb; å Á T Ú Ô O EÁ • ð; \* Áseákiæ) • ] æb^} o/s, ` à jæ Ás:[ { & v • Áse; à dæstā;}æ Á? } æj A\*/\* ð; \* ÉA & & } æ ás BÉseb; à A\* & [ } [ { & & A æ); æf • ^ • Ásee Áræ; A æ Ás@{ • ^ Ár { ] |[ ^ ^ å Áb; Ás@ Ár æ: ãs ð; ãs A æsé A; æ Ás@ Ásæ; æ Ás@ Ásæ; ãs A æ); æf • ^ • Ásee Áræ; A æ Ás@{ • ^ Ár { ] |[ ^ ^ å Áb; Ás@ Ár æ: ãs ð; ás A ás@ Ásæ; æ Ás@ Ásæ; æ Ás@ Ásæ; ãs c@ Á; l ä ð; æ Á/^ { ^ å ^ Ár / ^ & cã;} ÈÁ
  - & EÁ ~ č ¦ ٨& @ea) \* ^ Át Áo@ Áot \* !^\* æ A ʿ Át át åt å āçāā ` aq Á / ||Á ¢ cl æ& cāt } Á æ Á āļ Ás ^ Át æs ^ Át Áse ` | ^ Ás@ æÁs ` ` a æ ⁄ Át Áse ` | ^ Ås@ Áse ` ā^ ¦ Á āl Á [ ] ^ ^ å Á [ ] ^ ^ å Á [ ] ^ ^ å Á · é [ ] æs Át · Á · é [ ] æs Át · Á · é [ ] æs Át · Á · é [ ] æs Át · Á · é [ ] æs Át · Á · é [ ] æs Át · Á · é [ ] æs Át · Á · é [ ] æs Át · Á · é [ ] æs Át · Á · é [ ] æs Át · Á · é [ ] æs Át · Ás@ Át : ] æs Át · Ás@ Át : ] / Ås · é / Åt : ] / æs Át · Ás · é / Åt : ] æs Át · Á · é / Ås · é / Åt : ] / æs Át · Ás · é / Åt : ] æs Át · Ás · é / Åt : ] / æs Át · Ás · é / Åt : ] / Æs · é / Åt : ] / æs Át · Ás · é / Åt : ] / æs Át · Ás · é / Åt : ] / Æs ·
- IÈÁ Ø`č ¦^Á&@eð) \* ^•Áţ Á@ Áset \* ¦^\*æe^Áţ ¦Áş åãçãã `æ¢Å ^ ||Ár¢dæ&cāţ } Áæev•Á āļlÁs ^Áţ æå^Áţ Áse•` ¦^Ás@exA@ Á |æe^Áţ -Á^•q[ |æeāţ } Ąt -Ás@ Áset ă ā^ lÅ āļlÁ [ o/sa ^Á | [ , ^å/ҳ !Á^• ` |ofs Áseka` |æet } Ąt -Á^{ ^å^ A[ } \* ^!/Ás@ex Å &[ } c^{ } ] |æe^åAs ^Ás@ Áş ! að a¢ÁFJJHÁUWFÁÜUÖÁset å/ҳ ! ]ā \*Ás@ Ár¢dæ&cråAt ![ ` } å , æe^!Áţ Ás@ Á &[ } c^{ } ] |æe^åAs ^Ás@ Áş ! að a¢ÁFJJHÁUWFÁÜUÖÁset å/ҳ ! ]ā \*Ás@ Ár¢dæ&cråAt ![ ` } å , æe^!Áţ Ás@ Á [ } c^{ } ] |æe^åAs ^Ás@ Áş ! að a¢ÁFJJHÁUWFÁÜUÖÁset à Åş áf / ζ ]ā \*Ás@ Ár¢dæ&cråAt ![ ` } å , æe^!Áţ Ás@ Á ] ^!{ æ}^} oft !æt ` |æbÁse&cāçæe^åÁsætà[ } ÁţÜÕOEÔDÁr æe^!Á/!^æt ^} oft@æstājãc Áş Áp^, ÁÓ!ã @ţ } Áţ !Á^{ [ çæţÁ [ -ÁXUÔ•Ás ^Ása/ş !^••š !ã ^åct !æ) ` |æbÁse&cãçæe\*åÁsætà[ } ÁţÖOEÔDÁr • c^{ EA
- ÍÐÁÖãa&@æal\*a]\*ÁæqlÁd:^ææ^åÁ,ææ^¦Áq[Ás@?Á¤^,ÁÓ¦ã7@q[}Á(``}a&a]æqlÁsaādãa`ca[}Á(^•c^{EA
- Î Ă Monitoring the groundwater to verify effectiveness of the remedy through measurement of overall plume shrinkage (geographically) and decreasing contaminant concentrationsĂ

V@ÁUWFÁ^{ ^å^Á}&{ `} c'i^åÁæá, ^, ÁæjåÁ `à•œajœaak/ás•`^ÁajÁơŸÁOEFÍÁx@aak&[}cāj`^åÁ{ Áæ-^&oÁ^{ ^å^Á ]^!-{'{ aj &^Áaj (i Áx@Áã•oÁ`æcc'iA[ÁOEFJÈÁQÁ æ|^ÁOEFÍÉATā]}^•[cæáÖ^]æd(^}oA[ÁA?^æ¢c@ÁQTÖPDÁ][cãa?åÁ c@ÁÔãčÁ[Á-Á>, ÁÓIã@(I}Áx@exeAajÁ{ ^!\*ā]\*Á&[}cæ{ā]æjdÆTÊËãā[¢æj^Ê@aáAå^^}&ac^&c\*åAajÁ>^ ÓIã@[}qAjæc^!A`]][^ÁQjão@áa^c%&a[}•Á]Á{AR[}cæ{ā]æjdÆTÊËãā[¢æj^Ê@aáAå^^}&A`c%&c\*åAajÁ>^ ÓIã@[}qAjæc^!A`]][^ÁQjão@áa^c%&a[}•Á]Á{AR[}a&[[\*!æ{ •Aj^!Aão\*!Aãu\*EŠaEPÉ/@A>OÔÕÜÙÁ, ^||•Á¢dæ&cA '![`}å,æc^!A'[{ Áx@ÁÚ!æaāa?Áa`Aô@a^}AæjåÁ[{AR[!åæjÁCE`ã^!•ÁQM]]^!Áæ}åÃS[, ^!AM}ãADĚÔ[}&^}dæã[}A [-ÁTÊËËãa[¢æ]^ÁajÁæ{]|^•Á&[||^&c\*åÁ![{ Á>, ÁÓIã@{}}qÅa^]^!Á{`}3&3]æ4Á, ^||•ÁQT[`}oÁJa[]}ÁCE`ã^!DÁ

#### Á ØQJÔQEŠÁŸÒQEJÁGEFJÁGEÞÞWQEŠÁÚÒÜØUÜT QEÞÔÒÁÜÒÚUÜVÁ

, ^!^Ą[}Ëā^c^&dƏČŶ !!^}d^ÊĴ,[ÁFÊ Ëāā[¢æ]>^Á^å^!æ4å!ā]\ā]\*Á,æe?¦Á œa}å&å kæ?a @ LÁQ;\_^c^!Éæká œæ?ÁT ÖPÁ @ ædo@Áā·\Áā[āxÁQPÜŠDÁ;-ÁFÁµ\*EŠÁsi/Áj,Á]æ&^ÊĴ,ão@Á[[•oA], Áo@ÁFÊ Ëāā[¢æ]>^Á&[}&^}dæā]}•Á§jÁ æ{]|^•Á &[||^&c^åA4[{ Á@ Á¤ÓÕÕÜÙÁ\*¢&^^åā]\*Ás@ ÁT ÖPÆÜŠĔOEÆL<{ ^å^Åxã[ ^Ё `oA], æ Á, |æ&^åE&&~æ ā]\*Á¤ÓÕÕÜÙÁ []^!æaā[}Á]; ÁOE]¦ā/AFÍ ÊOEFÍ Ě/@ ÁÔãĉ Á;ã&@ å Á[Á]!^~!^} oædÁ\*¢dæ&cā]}Á'[{ Á&^^] Áæč`ã^!Å, ^||•Á, @å^Á ^çæj\*æaā]\*Á^{ [çæ4Á\*&@][|[\*ã\*•EĂOEA],ā[oÁcčå^A/][!oÁ[!Áæåçæ]&^åA[¢ãaæaā]}Ár&@@[|[\*^Á[!Ást^æ{[^}oA[c\*\*•oAOEFÎ ĚA

CEÁ, ¦^ |ã[ā]æ3^Áå∧•ā" } Á∧çā", Á æe Á@ |åÁ ão@Áo@ ÁCE{ ^Áæ) åÁ∧\*\* |æu[ ¦•Áāj ÁÖ∧&∧{ à^¦ÁO∈FÎ ĔÁOæd¦Á, æe Áeç ædå^åÁ æÁ&[} dæ&oAáj ÁT æ ÁO∈FÏ Áeo) åÁa^\* æ) Áo@ Áå^•ã" } Á, ¦[&∧••Át[ ¦Áāj•cæe|æaāt] } Át, -Á |dæçāt |^OA^æ&d[ ¦G DÁt[ Át/∞æAFÊË åãt ¢æ) ^ÁæeÁo@ ÁÞÓÔÕÜÙÈÁOEA, ^, Át/^æa{ ^} óÁv&&@[ |[ \* ^Á •ā] \* Á |dæçāt |^OED^\[ ¢ãā^Áæåçæ) &^åÁt ¢ãaæatat } Á ] [ c^} cãæpÁÇCEUÚDÁ, æe Á^|^&co\*åÁt[ ¦Ájāt[ cÁ č å^Áaj ÁG∈FÏ ÊÁ;ão@Át] \* ¦æå^•Át[ áœ;Át[ Ác@ ÁÞ^, ÁÓ¦ð" @at] } Á; æe^\kát^ææ{ ^} óÁ ] [ æ} óÆ{[ {] |^c^\*åÁsj ÁÞ[ ç^{ {`}a^\[ ÁG∈FÏ Á; @} Át` { ] ā] \* Át[ { Áã¢Át` } 3&āt]ætÁ ~ ∥e Á;æe Á∧•ææ¢ åÉV@ Áã¢Át ætát \* ætát ] [ æ} óÆ{[ {] |^c^\*åÁsj ÁÞ[ ç^{ {`}a^\[ ÁG∈FÏ Á; @} Át` { ] ā] \* Át[ { Áã¢Át` } 3&āt]ætÁ, ~ ||e Á;æe Á∧•æe cåÉV@ Áã¢Át ætát \* ] |æ} óÆ{[ {] [}^} o Át -Ás@ Á∧{ {`}a^A}f, \*•&iā^\*åÆt AFJJHÁU WFÁÜU ÖÉAU WFÁOEt ^}å{ {`}a\*AFÁÇCE€Ê DÆe^^Á¢çætĭæe^åÁ à^|[ , Éás &] \*åã &č••āt} Át -Ác@ Á~-∞&o Át -Ás@ Á<{ ^â^Aát ^Et ` oA; [ c\*âÁæt] [c\*ÈA

# ''% FYa YXm7 ca dcbYbhˈ̯%`5`hYfbUhY`K UhYf`Gi dd`m#K Y`` 5 VUbXcba Ybh

- •Á Ô|ælāā?ååkå^Áx@ÁOU1 Alternate Water Supply PlanÁQT[}č[{ ^\^ÁY æær[}ÁTJJÍDÁţÁkå^|^c^Ák&+ ãa^}c•Á , ãc@Áka^&æi •^Ác@Á^{ ^â^Áze]]|ā?•Át[Átc@¦Á, ^||•ÁtjÁzeååããţ}Át[Á^•ãa^}cãzekÁ, ^||•ÈV@Á,|æ)Áze\*[Áã:o\*ÁzeA] &iãc\!ãæA{[Åãk^}cã^2];\*Áx@Á, ^||•Áx@æcÁze^Ák]å\*ããa}|^Át[¦Áze)Ázec^!}æz^Á, æz^!Á\*]]|^ÈÁ
- Á Ô |æ áð à /á Â @ Á OU1 Alternate Water Supply Plan Á [ Á 🏘 [ /á ja & j ǎ ^ Á ^ || Á æ à æ ja [ ] { ^ } dĂ
- •Á Ô|æáãð å/å² Ás@ ÁOU1 Alternate Water Supply PlanÁÇ æť ^ÁäEDÁt Ást [Á] æ ÁJWHÁs) å/s@ ÁJWCÁ Ù㢠ÁDÁ @el[, Á',[`}å, æ¢\A,|`{ ^ĚA

#### DYfZcfaUbWY`GHUbXUfX`flck`Xc`mci`\_bck`k\Yb`mciBY`XcbYŁÁ

Ω[¦Ásqeơ\}æơ\Á æơ\Á ǎæ^\Á`]]|^ÊÁ, @}Ás@A,ʿ, }^\•A,ʿÁsqlÁ, ^||•Ás@æeA, ^^ơ/sqlÁs@Á{ ||[¸ā)\*Á&'ãæ4@æç^Ás^^}Á [~^\^åÁsq)åÁ,\[çãa^åÁ,ǎo@ásq)Ásqeơ\}æơ\Á æơ\Á خو^\أA`]]|^ÁQ;¦Á, @}Ás@Á, ^||A,ʿ, }^\•Á@æç^Á^b>&ơ\åÁs@A,`~^\•DxÁ

- 3EA V@Á, ^||/ās Á[ & acc^àá, ão@) Áo@ Ásc^ashe-^ & c^à/a î^á [``} å, acc^iA, iã ā acc^áscá) WOE 2000 Ásc ^ a fai a acc^áscá) WOE 2000 Ásc ^ a fai a acc^áscá) WOE 2000 Ásc ^ a fai a acc áscá) WOE 2000 ásc ^ a fai a acc áscá) WOE 2000 ásc ^ a fai a acc áscá) WOE 2000 ásc ^ a fai a acc áscá) WOE 2000 ásc ^ a fai a acc áscá) WOE 2000 ásc ^ a fai a acc áscá) WOE 2000 ásc ^ a fai a acc áscá) WOE 2000 ásc ^ a fai a acc áscá) WOE 2000 ásc ^ a fai a acc áscá) WOE 2000 ásc ^ a fai a acc áscá) WOE 2000 ásc ^ a fai a acc áscá) WOE 2000 ásc ^ a fai a acc áscá) WOE 2000 ásc ^ a fai a acc áscá) WOE 2000 ásc ^ a fai a acc áscá) WOE 2000 ásc ^ a fai a acc ásc ^ a fai a acc ásc ^ a fai a acc ásc ^ a fai a acc ásc ^ a fai a acc ásc ^ a fai a acc ásc ^ a fai a acc ásc ^ a fai a acc ás ^ a fai a acc ásc ^ a fai a acc ásc ^ a fai a acc ásc ^ a fai a acc ásc ^ a fai a acc ásc ^ a fai a acc ásc ^ a fai a acc ásc ^ a fai a acc ásc ^ a fai a acc ásc ^ a fai a acc ásc ^ a fai a acc ásc ^ a fai a acc ^ a f
- ãaÈÁ V@-Á,^∥,Áaşi Á&[{]|^c∿å,Áaşi Áxea-^&c∿å,Áseč ĭã^¦LÁse) å Á
- ãçÈÁ V@Á, ^∥/ÆiÁ•^åÆj, Áseá(æ)} ^¦Át[Ásæĕ•^Á\*¢] [•`¦^ÁÇ•^•Áse^/Æs^-∄, ^åÆj, Ás@ÁOU1 Alternate Water Supply PlanDAse) åÁ
- $c\check{E}\dot{A} = V@\dot{A} \wedge ||\dot{A}_{i} \rangle \wedge \dot{A}_{i} [\dot{A}_{i} \wedge \dot{A}_{i} (\dot{A}_{i} \wedge \dot{A}_{i} 

ΩÁ\*\ðtāa\^Á, ^||Á, } ^\•Á^~ • ^Áœ, Á, ~^\Át Áœ, Á⇔, Á⇔, Á⇔, Á⇔, Á⇔, Á⇔, A ] ^\-{ \{ ع) &^ A (ع) a a a a a b A ] ^\-{ \{ ع) &^ A (ع) a a a a b a b A

2[¦Á, ^||Ásæàæ)å[}{ ^} dÊ, @}Ás@Á, }^!•Á, Áœ∯Á, ^||•ÁsœæcÁ, ^^dæþÁs@Á[||[ َقَ)\*Á&iãov¦ãæó@æç>Áà^^}Á, -^\^åÁ æ)åÁ,¦[çãå^åÁsæàæ)å[}{ ^} dŷ[¦Á, @}Ás@Á, ^||Á, }^!•Áœæç^Á^b>&c\*åÁs@Á, -~\'•DAÁ

- ãaĐĂ V@?Á,^∥ÁārÁ&[{]|^cr°å/ÁşiÁæ)Áæ-^&cr°åÁæčĭã^¦LÁæ)åÁ
- amati V@Á, ^ ||Á&[} cæað, Á&^ c\* & cæaða|^Á&[} & A; dæaða] Á; Á&@ Á≂ÓBOEP ÁU`] ^ ¦ ~ } å ÁÚãe^ Ë^|æer^åÁÔUÔ• Áãa^} cãa\* åÁ
   [} Á; æt ^ Árī À; Á@ ÁrJJHÁUWFÁÜUÖÁQ; ¦ Á; æt ^ ÁGÎ Á; Á&@ ÁrJJGÁUWHÁÜUÖÉA; ¦ Á/æàa|^ Ár Á; Á@ ÁrJJÏ Á
   UWGÁÜUÖÉAæe Áæða] ¦ [] ¦ãæer^Á{; ¦ Á@ Á; ~ ||Á[ & ææða] > DúÁæða åÁ
- ãçĚÁ V@^Á,^||Á, æ•Á&[}∙dĭ&cråÁ,¦ãį¦ÁqíÁo@ÁTÖPÁÙYÔOE&æåçã+[¦^LÁae)åÁ
- çĚÁ V@^Á,^||Æa;Áa^ā)\*Á•^åÆa^Áo@Á,^||Æ,}^\Á,!Á•^Á, æəÆaā&[}œ]`^åÆa`^Æ[Æa]`æ&o•LÆa)åÁ
- çãĂ V@Á,^||ÁārÁ•^å/āşÁæá(æ)}^¦Áq[Á&æě•^Á\*¢][•`¦^ÁÇ•^•Áæd^Áa^-āj^åAşiÁœÁQEc\*¦}æe\*ÁYæe\*¦ÁÙĭ]]|^Á Ú|æ)DĂ

QÁ^|ðtāða|^Á,^||Á,}}^¦•Á^~ĕ•^Ás@A,[~~\¦ÁL¦Ásaàaa)å[}{ ^}6Åzeða Ásaþ•[Áæaãaā•Ás@A,^¦-{¦{ að &^Á cað)åædå ÈAOE,Á ^¢&^]cāL}ÁL[Ásaàaa)å[}{ ^}c^,[č|åÁs^ÁãaÁs@Á,^||ÆsA,^^å^åÁL¦Át¦[č}å,]æe^\Á,[}ãuE'A

#### =g'i\ ]g'fYa YXmWca dcbYbhVY]b[ ']a d`Ya YbhYX3'

- HÈÁ Ùæ{ ] |^Á, ^ ||•Á; } Áæá, ¦^•&¦ãa^åÁ&@\*å` |^ÉÁ

Á ØÒÙÔŒŠÄŸÒŒÜÁG€FJÁŒÞÞ₩ŒŠÁÚÒÜØUÜTŒÞÔÒÁÜÒÚUÜVÁ

IÈÁ Væ∖^Ác@^Áce]]¦[]¦ãæe^Á&[č¦∙^Áį, Áce&cãį}}Áj,^¦Á^•č|o•ÉÁ

Á É Á W] åæær^Áso@ Á, ^||Ásjç^} [; Ásiææææiær Á, ão@ake) ^Á, ^, Ásj, -{; {ææāj} Å Q≎ È È Á; æær/k č æ¢āc Á^•č |o• È Á; } ^; A' Å ā; -{; {ææāj} Ê Á; -{; {ææāj} Âsiær^\*; } â (2 & ae af ); A b; -{; {ææāj} Âsiær^\*; } â A

ÎÈÁÜ^][¦OÁ3)å3)\*•Á5)Áo@ÁOEÚÜÈÁ

V@A{[ ||[ , ]] \* Á × ^• cī[ } • Áæ) å Áæ) • , ^ ¦• Á × { { ætã ^ Åå^ç^ |[ ] { ^} o• Á ]] & & Ác@ Áæ cÁCEÚÜÁ, ãc@Á^• ] ^ & & Á[ ÁUWFÈĂ

8]X'h\Y'UfYU'cZWcbWYfb'k]h\]b'CI%WYUb[Y'Xif]b[':M'&\$% žUg'XYZ]bYX'Vmh\Y')'±[#@Wcbhcif``]bY3'

CEÁ@Q,}Áį}Á28ā č¦∧Á+Ë=Ébs@Ásel^æ4(, Á&[}&^\}Á\$sãaÁ,[ơ&\$k@e);\*^Á?ā}}ãa3ca);d^Ásč¦āj\*ÁØŸÁG€FJÈA/@Á,^∥Á ājç^}d[¦^Á;čå^Ásel^æ4A}&{[{] æ=●^●Ás@ÁØŸÁG€FJÁsel^æ4(, Á&[}&^\}ÈÁ

K YfY'UbmUXX]h]cbU'k UhYf'gidd`mik Y``g'X]gWcjYfYX'k ]h\]b'h\Y'UfYU'cZWcbWYfb'Zcf'CI%h\UhUfY' Wcad`YhYX'k ]h\]b'Ub'Uei]ZYf'cZWcbWYfb3'

Þ[ ĂÛ^^ ÁŨ; ] ^} åã¢ÁÔÁ; ¦Áscå åãã; } æ;ÁŠ; -{ ¦{ æ;ã; } ĔÁ

K YfY'Ubmik UhYf'gidd`mik Y``g'k]h]b'h Y'UfYU'cZWcbWYfb'Zcf'CI%gUad`YX'Xif]b[`:M'&\$% `fcihg]XY' cZh cgY']bWiXYX']b'h Y'CI%dYfZcfaUbWY'acb]hcf]b[`d`Ub43`=ZmYgžk \Uhik YfY'h Y'Z]bX]b[g3Á

Þ[ĚÁ/@Á,^¢ó4&[{]¦^@}•ãç^Á;æ{]|ð]\*Á?ç^}ó4{[¦Á,æe^¦Á\*]]|^Á,^||•Á,ão@3)Ás@ÁJWFÁse^æ4(,Á&[}&^\}Á§iÁ •&@å\*|^åÁ{[¦ÁØŸÁGEGEEĂ

KYfY'Ubmik Y``ck bYfg'cZZYfYX'Ub'U'hYfbUhY'k UhYf'gi dd`mUbX'cf'k Y``'UVUbXcba YbhXi f]b[ ': M'&\$% 3Å

Ÿ^•Éxc@Aţ,}^\Aţ,Axc@Aţ^||A[&aaz^åAsazAGÍ€IAGÏc@ACE;^}`^A>DÀ\$JADaa3JoACE;c@;}^A;aeA&[}caa&c\*åA^\*asłå3j\*A ,^||Asaàaa}å[]{{ ^}cA}dE¥/@Aţ^||Aţi|A\$a^A\*ae`\*^åAsa}åAraet]|^åA\$a`¦3j\*Axc@AØŸAG€G€A\*ç^}cAsa}aBE#saAxc@Aţ^||Aţ ^^oA c@A&lac^laadE4\_ajIA\$a^Asaàaa}å[}^aEA

:cf`CI%zUfY`N\YfY`UbmikY``ckbYfg`N\UhiaYYh'N\Y`W]hYf]UzVih\UjY`bchmYhVYYb`dfcj]XYX`Ub` UhYfbUhY`kUhYf`gidd`m\$Á

Þ[ 🛱

: cf'Cl %zUfY'h YfY'Ubmik Y``g'h Una YYhh Y'W]hYf]UzVi h\ Uj Y'bchmYhVYYb'UVUbXcbYX3'

Þ[ 🛱

=gʻUbmigUa d`]b[ʻcZk UhYfʻgi dd`mik Y`gʻfMI Wi X]b[ʻh\cgY`]bWi XYX`]bʻh\Y`CI %dYfZcfa UbWY` a cb]hcf]b[ʻd`UbL`dfcdcgYX`df]cf`hc`h\Y`bYI hifYdcfh8'

Ÿ^∙ĚÁ/@^Á,^¢oÁ, abb,¦Á a∉]|ā,\*Á^ç^}o∕≦rÁ&@∘åĭ|^åÁ{,¦Á∂ŸÁΘ€G€ĔÁ

5 fY'h YfY'UbmWYUb[Yg'cf'UXX]hjcbU'UWVjcbg'fYei]fYX'Zcf'h ]g'fYa YXmWcadcbYbh8Á

Þ[ 🛱

### ' "&` F Ya YXm7 ca dcbYbh [ & 8 f]``]b[ '5 Xj ]gcf]Yg`

8 YgW]dh]cb.ÁkQa ] |^{ ^} cā) \* Ási¦āj|ā) \* Áscáiçãa [¦ā?•Ás@exeÁ [č|åÁ^\*č|ææ^Ás@ Ásj•cæa|ææāi] Ai,~Á,^, Á;¦ãçææ^Á, ^||•Á jãc@ajÁs@ Á¤ [¦c@Áu]č{ ^Áse=ÁscAÙY ÔODÈAQFJJHÁUWFÁÜUÖEAjæ\*^ÁODĚA Á Ø©ÜÔŒŠÄŸÒŒÜÁG€FJÁŒÞÞ₩ŒŠÁÚÒÜØUÜTŒÞÔÒÁÜÒÚUÜVÁ

#### DYfZcfaUbWY`GHUbXUfX`flck`Xc`mci`\_bck`k\Yb`mciBY`XcbYL`

20[¦Á\$jãuãæd,Á\$j]|^{ ^} cæeāj}E\$, @}Áx@ATÖPÁ@ee,Á\$v+`^åÁæAÛYÔCEÁCEåçã[¦^ÈÁQ]|^{ ^} cæeāj}Á,ā|A&[}cāj`^Á}cājÁ •`&@Ásāj^Ás@eeÁs@Át¦[`}å,æe^¦Á&[}&^}dæeāj}•Áse4^Ás^|[,Ás@Á&4^æ)`]Á^ç^|•ÈÁ

#### < Ugʻh\Y`A 8 < `]ggi YX`U`GK 7 5 `5 Xj ]gcfm8`

Ÿ^• ÊBş ÁR" } ^ ÁFJJÎ ĚKQ ÁR" } ^ ÁFJJJÊKs@ ÁT ÚÔCEÁ^`` ^• c^å Ás@ ÁT ÖP Á¢c?} å Ás@ ÁÙY ÔCEÁs[`} å æ' Á\* ¦c@ ¦Á •[`c@, ^• cÁţ Ás@ ÁT ã•ã•ã] ] äÜãç^¦ Ásg å ÁT æ• @æļlÁCEç^}` ^ Á?} \*` ¦ā] \* Ás@ Á[` c@ ¦} Ás[`} å æ' Á\* ||^ Á ^} &[ { ] æ• ^ å Ás@ Á, |` { ^ ĚV @ ÁÙY ÔCEÁst#•[ Á&[ ç^¦• ÁU WHÁse] å ÊŠæ• Á, ÁCEŢ ¦ ājÁGEFÎ ÊŠæļlÁ, ÁU WEĚV@ Á&` ¦!^} cÁ à[`} å æ' Á, Ás@ ÁÙY ÔCEÁst Á: @ , } Á; Á2ã` ¦^ ÁÒËFÁCEŢ ] ^} å ã¢ÁODEĂ

5 fY`Ubm'W(Ub[Yg`cf`UXX]h]cbU`UWH]cbg`fYei]fYX`Zcf`h\]g`fYa YXm'WcadcbYbh8``

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### '"` FYa YXm7 ca dcbYbh;'.'91 lfUWh; fci bXk UhYf`

8 YgW]dh]cb. ÁÒ¢dæ&cāj\*Á'¦[`}å, æe^¦Á';[{ Ás@ Á₽[¦c@ÁU|`{ ^Á•āj\*Ás@ Á₽ÓÔÕÜÙÊA`àb/&cA{[ Ás@ Á{[ ||[, āj\*kÁ

- FĚÁ V@ Áşi ãuãad,Áset \* ¦^\* æc^Á ¦[`}å, æc^¦Á^¢dæ&dąi}Áæc^Á, āļÁà^Á&[}•ã:c^}c^, á, ão@áo@ Á[}\*Ëc^¦{ Á;]^¦æaā}\*Á @ā•d[¦^Á;-Ás@ Á= ÓÔÕÜÙLÁ
- HÈÁ Ø`č'\^Á&@eà,\*^•ÁţÁ@eÁ;\*A\*æc^Á;¦Áşiåãçãã`æþÁ,'\|Á\¢dæ&eā;}Åæe\*•`;^Á&@eA;ÁţÁæe\*`;^Å@eA; |æc^Á;Á^•q[:æeā;}Å;Á©éA;či@eA;Å;ÅjÅ;[oÁs\Á;][,^å/Á;lÁ^•`]oÁşiÁæáš`;æeā;}Å;Á^^{ ^å^{ }, \*A\*{ &[}c\*;] &[}c\*{]]æc\*àÅs^Á©@Á;i∄i∄;ædÁ;JJHÁUWFÁÜUÖLÁ

V@[`\*@ÁRæ)`æ^ÁQEEÌÉ&@ Á^{ ^å^Á&[{][}^}ơ&[}eã cô å Á; -Á^&[ç^¦ā]\*Á§^^]ÁQV}ā Á DÁt¦[`}å, æc^¦Á•ā]\*Á c@^^Á;¦ā[æ^AÔãĉ Á; -ÁP^, ÁO¦ã @[}Á, ^||•ÁQD^, ÁO¦ã @[}ÁT`}&Ba] ædAãÞÓT á Ål ÉÅAFI É&e) å AÅFÍ DÁ, ã @Á@^^Á æc^¦}æc^Á, ^||•ÁQÞÓT ÁÀHÉAÁI É&e) å ÁÅI DĚÞÓT ÁÀH&e) å ÁÅI Á, ^¦^Á¢ãa cā]\*Á, ^||•Á&[{]|^c^å Á§JÁ§[c@Á@ ÁÚ¦æaāð Á§`Á Ô@A}Áæ) å ÁR[¦åæ) Á[¦{æaā]}•ÈÞÓT ÁÀÍ Á&e) å ÁÅI Á, ^¦^Á¢ãa cā]\*Á, ^||•Á&[{]|^c\*å Á§JÁ§[c@Á@ ÁÚ¦æaāð Á§`Á Ô@A}Áæ) å ÁR[¦åæ) Á[¦{æaā]}•ÈÞÓT ÁÀÍ Á&e) å ÁÅI Á, ^¦^Á¢ãa cā]\*Á, ^||•Á&[{]|^c\*å Á§JÁ©(ÁR[¦åæ) Á[¦{æaā]}ĚÅ ÞÓT ÁÀFI Á&e) å ÁÞÓT ÁÀFÍ Á, ^¦^Á&[}•d`&c\*å Á§JÁ© ÁÚ¦æaāð Á§` ÁÔ@A}Á[¦{æaā]}Á&e Á;æaā]} Á@ ÁA{{} ~åc@ ÁA{{} ~åc à^\*æ) Á,`{]ā]\*Á§JÁÖA&A{{} a^¦ÁFJJÎ Á&e) å ÁT æ&@ÆJJÌÉÅ^e]^&aãç^]`ÉÁ/@Á[&æaā]}•Á;Á©ÁA&[ç^¦^Á, ^||•Á&A •@\_; }Á;Áœãč ¦^Á+ÉFĚÁ

V@A^¢dæ&c∿åA\*¦[`}å,æe^¦AãrA`•^åAæeA;æoA;A@A>^,ÁO(a\*@{}}á,æe^¦A`]]|^A^•c^{E&ee}åAæeA`&@AP^,Á Óla\*@{}}Á{{[\A©A/~æåA;}Åå^•a\*}Aæ}åA&{}•d`&aqi}A;AœA\*•c~{Aœ}åA®aA®aA\*•][}•aa|^A{{¦A^•c^{A};}A V@A^å^¦æ4A\*{[ç^¦}{^}o#a\*A;æêaj\*A{¦AœAUWFA^{^å^EA

Q ÁGEEÎ ÊE⊳^, ÁÓ¦ā" @{}}Á¦[][•^åÁ{[Ás@ ÁGE{ ^Á[[åã²ā]\*Ás@ Áset ¦^^{ ^} } ^\$shorg ^^} Ás@ Ás; [Á];æta?•Á{[Áset|[, Á { [¦^Áq^¢ãaājāĉ ÁsjÁ≂ÓÔÕÜÙÁ;]^¦æaāj}ĚasejåÁ{[Ásj&¦^æ=^Á^{ [çæ‡A[-Áse]];œetjājæ];oá(æ=•Á¦[{Ás@ Ásĕ čã^¦ÈAQA Þ[ç^{ à^¦ÁGEEÏ ÊEs@ ÁNÙÒÚCEsejåÁT ÚÔCEA;¦[çãå^åÁs[]•ã:c^}&îAs]]¦[çæ‡A[-Ás@ Á^çã:^åAjč{]]ā]\*Áæe\*•ÈA CE[]^}åã¢ÁCEĔÁÇVæà|^ÁÖËFÁæ)åÁ/æà|^ÁÖËGÁ¦[{Ás@Ai^cq^{^}ofset¦^^{ ^}ofset¦^^{ ^}ofset¦^^{ ^}ofset¦^^{ ^}ofset¦^^{ ^}ofset¦^^{ ^}ofset¦^^{ ^}ofset¦^^{ ^}ofset¦^^{ ^}ofsetlofset

V@Á^çã^åÁj`{] āj\*Áæj]¦[æ&@ás[^•Á,[okæ-^&oko@áæj]¦[ç^åÁœæārœãæa‡Áæjæf•ãrÁ•^åÁs[Áşæ‡`ææ^ÁœA ^-~&&cãç^}^••Á;Ás@Á^{ ^å^ÁærÁ^ó4[¦c@ás^Ás@ÁUVFÁÜUÖÁCE[^}å{ ^}œÄFÁçGE€ÎDĚV@ÁCE{^ÁœerÁ;æå^ÁaA &|^æA&[Á¤^, ÁÓ¦ãt@t]}Ás@æe#āaÁs@Á&@æj\*^•Á&ææārcã&æ‡A\$şæatī}Á^•č|orÁs@æe#æb^Á,[o4ājÁ&[{]|ãæj&^Á \_šã@ás@ÁUWFÁÜUÖÁCE{^}å{ ^}oÅFÁçGE€ÎDÊ&c@Á,`{]āj\*Áæ|[&æatī]}•Á,āj|Á^ç^¦óAt[Ás@Á;¦^çāt`•Á&@{^ÈĂ

DYfZcfaUbWY'GHUbXUfX'flck'Xc'mci'\_bck'k\Yb'mciBY'XcbYL'

Y @}Áx@ÁÞÓÔÕÜÙÁā;Á;]^¦ææāj\*Á&[}•ã:c^}cÁ;ãx@Á[}\*Ëc^¦{ ÁÞÓÔÕÜÙÁ;]^¦ææāj\*Áæe^•ÈÁ

8 i f]b[ˈ: Mī&\$% žX]X`h\Y`CI%YI hfUWNjcb`gmghYa`cdYfUhY`dYf`h\Y`BYk`6 f][\hcb`cdYfUhjcbU`d`Ub`UbX` Wcbg]ghYbhik]h\`dUghcdYfUhjcbg3Á

Ÿ^•ĚÓæ•^åÁ;}Á;æ•ơá;]^¦æaā;}•Êbo@ Áæa\*^okaæ;^¦æ\*^kåæā;îÁ;`{]ā;\*Áæe^Ašaráh ÉFÎÌÁ;āļlā;}Á\*æd;[}•Á;^¦Ååæô Áæe Á •@\_;}Á§;ÁQEj]^}åãeAQE ĚQ0,ÁQŸÁQEFJÊbo@ Áç[|`{^Á;-Á;æe^\;Á;`{]^å&a\*Asô Ás@ Á¤OÔÕÜÙÁ;æ\*ÁlGJÈTIFA;ā]lā;}Á \*æd;[}•Êý;@3&@Asiæ)•]æe^•Át;Áedsáæã;Áecç^¦æ\*^Á;ÁGÈTIIÁ;ā]lā;}Á\*æd;[}•Á;^¦Ååæ`LÁ@;\_^ç^\Êbo@ Á¤OÔÕÜÙÁ;æ\*A []^¦æe^åÁ§;Ácæe'c]Á&[}åãaā;}Åå`¦ā;\*ÁU&q[à^¦Áæ}åA¤[ç~{}à^¦ÁGEFIÊA^•`|cā;\*Á§;Áed{[, ^\;Áæç^¦æ\*^Ååæa‡îÁ ç[[`{^Á;`{]^åÈA'@ Á¤OÔÕÜÙÁ;]^¦æe^åÅ&[}•ã;c?oÅ;ãc@A;æ;oA;]^¦æaāā;}•Áæe<¦Á`||Á^•e<{ÁcædĖ]ÈA

5 fY`UbmiW(Ub[Yg`cf`UXX]h]cbU`UW1jcbg`fYei]fYX`Zcf`h]g`fYaYXmiWcadcbYbh3`

Þ[ 🛱

# '"(`FYa YXm7ca dcbYbh (.`FYa cj Ư cZJC7g Vm; 57`

V¦^ææ{ ^}o\$a^ Áx@ ÁÚÕOEÔÆia Æi^a]\*Á\*]]|^{ ^}c\*åÅ äx@&i^ææ{ ^}o\$a^ Áx@ ÁOEUÚÁ\*•c\*{ÁÇae[}\*Å äx@&i[}&ea}åA { æ}\*æ}^•^Á^{ [çæ‡Áse}å&@[¦a]ææa]}DÁ;æ\*A\*•Áx@Á^&[ç^¦^åÅ'![`}å,æe^\Á\*ãææi|^Á[¦Á;`}a&a]æ4&ia]\aj\*Á ;æ\*¦Á;`}][•^•ÊÅ äx@Á^•]^&o4k@[kUÔ\*Áse}åÁEÊËäa[¢æa}^ÈÆV@Ái^ææ{ ^}o4\*•c\*{ÆiA[&æe^\*åAse]]![¢a]æe\*|^Á [}^Ëc@aåáA;ā^A[`c@A;AQ;c\*I\*œæ\*ÂJIÁ;^æaAùāç^!AŠæa\*^AÜ[æåÈEV@ÁÔãcÁ;A=^,ÁOiāt@[}ÆiA^\*][}\*äa|^A{;!Á []^!æaã]}Áse}åA;æa}c\*}a}&A;A;Ax@ÁUÕOEÔÊ;ãx@&[\*o4^ā]à`I\*^{ ^}c\*{ ^}o4{E{ ^AF\_ AE} []^!æaã]}Áse}åA;&@Á^{ ^a^ÈA

### DYfZcfaUbWY'GHUbXUfX'flck'Xc'mci'\_bck'k\Yb'mciBbY'XcbYL'

Y@}Ás@Ás!^æe^åÅ;æe^¦Á;^^o•Ás@Á;æçā;`{Á&[}ææ;ā;æ;ð;æ;ð;æ;ð;æ;ð;æ;ð;æ;áÅQTÔŠDÁæ;)åÅ;[}Ë^¦[Á;æçā;`{Á &[}Ͼ;ð;æ;ofA^ç^|Á\*[懕Á\*•œæ;)ã:@åÁsî^Ás@ÁJæ^ÁÖ¦ð;\ð;\*ÁYæe^¦ÁOB&oÁ{[¦Ás@Á&[}•oãč`^}o•Á;Á&[}&^¦}ÊÁæeÁ ãå^}œãtåá{;}Á;æ\*^ÁrÌÁ;Á∞@ÁFJJHÁJWFÁÜUÖEĂ

### 8]X'h\Y'hfYUhYX'k UhYf'a YYhih\Y'A7@g'UbX'bcb!nYfc'aUI]aia'WcbhUa]bUbh`YjY`[cU'g'YghUV`]g\YX` Vmih\Y'GUZY'8f]b\_]b['K UhYf'5WhZcf'h\Y'CI%W(Ya]WU'g'cZWcbWYfb3''

Ÿ^∙*Ĕ*Á

### =gʻUbmigUad`]b[ʻcZh\Y`hfYUhYX`kUhYf`dfcdcgYX`df]cf`hc`h\Y`bYIhifYdcfh8Á

Ÿ^∙*È*Á

#### 5fY`UbmVV(Ub[Yg`cf`UXX]h]cbU`UVV]cbg`fYei]fYX`Zcf`h]g`fYaYXmVVcadcbYbh3`

# '') FYa YXm7 ca dcbYbh; ). 8 ]gW Uf[ Y`cZHfYUhYX`K UhYf`

8 YgW]dh]cb. "\@ã&@eet\*ā]\*Áee|ÁįÁ@eÁst^æertåÁ;æertká[Ás@AÞ^;ÁÓtā?@e[}Á;`}a&ā]æeAsaādāa`cā[}Ár^•cr{ÈA ĢFJJHÁJWFÁÜUÖÉAjæt\*ÁEDDĂ

DYfZcfaUbWY′GHUbXUfX′flck′Xc′mci′\_bck′k\Yb′mciBbY′XcbYL′

Y@}Á@?A&[}}^&ca[}Á\$[Ás@?Á¤^,ÁÓ¦ã\*@{}Á;`}3&3]æ¢Á`]]|^Á^•c^{{Á@æerÁà^^}Á&[{]|^c^àÁæ9}åÁ;æe^¦Á&A´ à^3]\*Áåãr&@æet\*^åÈĂ

=g'h\Y`lfYUhYX`k UhYf`VY]b[`X]gW(Uf[YX`hc`h\Y`BYk`6f][\hcb`aib]V]dU`X]ghf]Vih]cb`gmghYa3``

Ÿ^∙ĔĂ

5 fY`UbmiW(Ub[Yg`cf`UXX]h]cbU`UW1jcbg`fYei]fYX`Zcf`h]g`fYaYXmiWcadcbYbh3`

Þ[ Ă

# '™` FYa YXm7 ca dcbYbh; \*.; fci bXk UhYf`A cb]hcf]b[`k]h` JYf]ZJWUh]cb`cZ7 cbh]bi ]b[`5 ei ]ZYf`FYghcfUh]cb`

8 YgWV]dHjcb.Á756[}ãt[¦ā]\*Ás@Á\*¦[`}å, æe^¦Át[Áş^¦ã^Ás@Á\*~^&saāç^}^••Á;Ás@Á^{ ^å^Ás@[`\*@át, ^æe`¦^{ ^}cÁ [-Á;ç^!æ|Á,|`{ ^Á;@ā} \æ\*^ÁÇ^[\*¦æ]@38æ||^DÁse)åÁså^&¦^æeā]\*ÁS[}æe{ā}æ)cÁS[}&^}dæaā]}•ÁQUWFÁÜUÖÁ Ot[^}å{ ^}cÁ;FÁçGee€1DÉA;æ\*^Á,ÉHDEÁ

DYfZcfaUbWY<sup>\*</sup>GHUbXUfX<sup>\*</sup>flck<sup>\*</sup>Xc<sup>\*</sup>mci<sup>\*</sup>\_bck<sup>\*</sup>k\Yb<sup>\*</sup>mci<sup>\*</sup>DY<sup>\*</sup>XcbYL<sup>\*</sup>

Y @} Á\^¦-{ |{ a\$} &^ A`|[`} å, aæ^\A`, [} ãt[ |ā] \* Áç^\lãa\• Ásĕ čã^\A´^• d[ |aæaī] ÈĂ

=gʻh\]gʻfYaYXmWcadcbYbhVY]b[`]ad`YaYbhYX3`

Ÿ^•ÈÁÚ^¦-{¦{ æ}&^Á; [}ãī{¦āj\*Áj¦[\*¦æ{•Á@æç^Áa^^}Å\*^@æà}Ã\*eææà]ã@åÁ&[Á&[||^&cAso@ÁaæææÁ^``ā^åA&[Áç^¦ã÷Ás@Á ^~~^&&aãç^}^••Á,-Á^{ ^å^Á&[{][}^}o#ÀFÁs@[`\*@ÀÂÈZ/æà|^Á+ÉEÁ`{ { æ}ā^•Ás@Á,^¦-{¦{ æ}&^Á{[}3ã[¦āj\*Á ¦^``ā^{ ^}oÉ&[]|^{ ^}cāj\*Ájæica\*•É&ejåÁs@Á]^&ãã&A&[&`{ ^}o#ás@æek&[}cæajÁs@Á[]ã€[¦ãj\*Áj|æ}•ÈÁ

### K YfY'N Y'[fcibXk UNYf'acb]hcf]b['fYei]fYaYbhg'Zcf'N ]g'fYaYXmaYhB''

Ÿ^•ĚdØŸÁGEFJÁ, æ ÁzdÁ‰ ðj [¦+Áæ{]|ðj\*Á^æłĚOE[ÊÁ, ãr@Ás@A&^&&dī]}Á, ÁFÊËäði ¢æ)^ÁðjÁs@Á⊳ÓÔÕÜÙÁ, ^||•ÉÁ c@ÁWÙÒÚOEæ) åÁT ÚÔOEÁ^``^•¢åÅc@æcÁs@ÁOE{^Áæ}æf:^Á\*¦[`}å, æc^¦Áæ{]|^•Á[¦ÁFÊËäði ¢æ}^ÁœÁæ#|Á •&@å`|^åÁJWFÁæ{]|ðj\*Á[&æeði]}•Áå`¦ðj\*Ás@Á`{{^\ÁØŸÁGEFJÁæ{]|ðj\*Áç^}œÁ?`ã^åÁæ)åÁ ¦^``^•¢åÁæ{]|ðj\*Á; ærÁs[{]|^cåĚÁ

#### =gʻUbmi[fcibXkUhYfʻacb]hcf]b[ʻdfcdcgYXʻdf]cfʻhcʻh\Y`bYIhifYdcfh3ʻ

Ÿ^•ĚÁ/@ ÁUWFÁ\*¢dæ&cāį}Á^•o\*{Á, æ•Á^•œe'c\*å/ājÁ¤[ç^{ à^¦ÁQ∈FÌÁæjå/á;[}c@?Á;[}ãã[¦āj\*Á;Á∞@Á ^¢dæ&cāį}Á;^||•ÁæjåÁd^æa{ ^}o^A^•o\*{Á\*~-j\*^}cA;æ•Aj^¦-{¦{ ^å/as`Ás@ ÁÔãî Aj-Á¤^, ÁÓ¦ã\*@2[}ÁājÁæ&&2[¦åæj&^Á ;ão@Áx@ Ákaa^;ÁÓ¦ā\*@2[}Áræz\*¦ÁĴ\*•o\*{ÁDae{]|āj\*ÁæjåÁ005;æq\*•ãrÁÚ|æ)Êa/At\*}^ÁFJJÏĚÁ Uc@¦Át¦[`}å, æe^\Á,[}ãq[¦ā)\*Á,āq|Áa^ÁajÁæ&&{[¦åæ}&{[¦åæ}&A,ā;āc@Ác@AÕ¦[`}å, æe^\ÁT[}ãq[¦ā)\*ÁÚ|æ)Áaj&|`å^åÁæe Á OF[]^}åãeÁODEEÉADEÁ%,o3][¦+Á?ç^}cÁ, æe Á&[}å`&c^åÁ{[¦ÁØŸÁOEEFJEÁ/@Á,^¢cÁ%,oætp[¦+Á,^||Áajç^}q[¦^Á;æ{]|3]\*Á ^ç^}cÁsiÁ&@@å`|^åÁ{[¦ÁØŸÁOEECEEĂ

#### 8 cYg`[fcibXkUhYf`acb]hcf]b[`g\ck`Uei]ZYf`fYghcfUh]cb`]g`cVWV ff]b[3`

V@ Áa` ¦ & å å Áçæļ/^ • Á, æ Áseko Áse Á@ å | æ læ Á @ ¦ dæ `o Éæţ|[ , ā \* Á ¦[ ` } å , æ \* ¦ Áţ Á, [ ç ^ Ås á \* & d ^ Å+[ { Á\} ǎ a ⁄ Å + Å & d ^ Å + Å & d ^ Å + Å & d ^ & d ^

Á Ø©ÜÔŒŠÄŸÒŒÜÁG€FJÁŒÞÞ₩ŒŠÁÚÒÜØUÜTŒÞÔÒÁÜÒÚUÜVÁ

-{||[, 引 \* Á@ ÁØŸÁΘEFÍÁ æ; ]|3) \* Á°ç^}ơka)åÁ æ Ąià•^¦ç^åÁ|ãt@/`Áædo@¦A;[¦c@kætæna)Á9iÁØŸÁΘEFÎÈÁ O7aåãna]}æpÁæ;[]|3) \*Á, a]|Aa^Á,^å^åÁt[Á^^ÁaÅa@kt^}åÁs[]c3) \* ^•Êaa)åÁt[Áa^c^¦{ 3) ^ÁaÁœÁ, ^•oÁ\*å\*^Á; Áa@Á ]|`{ ^Á5jÁæt^æ Á[`c@á, ÁœÁÞÓÔÕÜÙÁad; [Áa^\*a)Át[Á @Q, ÁætÁa] a]ætÁt^}åĚÁ

$$\begin{split} & \forall @ \hat{A} \cup WF \hat{A} \land \& @ \hat{B} & a a a \hat{A} \hat{G} & a \hat{A} \hat{G} & a \hat{G} & a \hat{A} \hat{G} &$$

%%^¦ã^Á¦[\*¦^••ÁşiÁ&|^æj`]ÁįÁ@A;|`{ ^Á@A;|`{ ^Á@[`\*@A; ^æ`¦^{ ^}@A; ^A; ç^¦æ|A\*^[\*¦æ];@&A;|`{ ^Á;@3; \æ\*^Á æ)åÅ\$^&¦^æ3;\*ÁÔUÔÁ&[}&^}dæaaj}•ÈÁ

V@ÁJWFÁG€€IÁ/^&@; 38æ¢ÁT^{ [¦æ};å`{Áãā^}cã&;åÁãç^Áãr•`^•Ás@æcÁ,^^åÅq; Áà^Ácæcã; c38梦^Á°çæ;`æc^åÅjão@Á ¦^•]^&Avát[Ás@Áæà][ç^Átjàb%cãç^KÁ

- FĚÁ T ^æ ` ¦^Á&@e) \* ā) \* Áš[ } &^ } dæaā, } ékā { ^åãæe^ [^Åå[, ] \* ¦æåã } oh( ~Å@ Á/ÕÜÜÉæe Ás@á Áse^ æáā Ás@ Áã• oh( Åā) oh (Åā oh( Åā oh( Åa oh( Aa oh(
- GĚĂ T^æe\*¦^Á&@ea)\*^•Á§JÁc@ Á\*^[\*¦aa]@a&aa†Áiã^Áį,-Ás@(Á),|`{ ^Á;ç^¦Ásąī ^ÈĂ

- Í ÈÁ T ^æ\* ¦^Ás@ᦠ}\* Ë^\{ Ásì^}å•Ásjá;ç^¦æ|ÁXUÔÁS[} &^} dæaāj} •Áçæáæçá; }åjå å&aaaa[¦Á; ÁÔUÔÁ;æ•DÉV@ãA ] {[çãa^+Áaà]Á;ç^¦æ|Á;ã&č`,^Á; -Án<{ ^åãæ4Á;!] \* !^+ ÈĂ

*Group 1: Downgradient of the TGRS capture zone*.Á/@āÁ[}^Á@q` ¦åÁ@q` Á^å`&cāţ}•Áţç^¦Ásāt ^Áş Á |^•][}•^Áţ Á/ŐÜÙÁţ æ•Á^{ [çæ‡Áse}åÁs[}cæ3j{ ^}dĚŐ¦[`}å¸ æc^¦Áş^|[&ãata\*Á(æ\*Á\*á\*á\*á\*á\*á\*á\*á\*á\*á\*á\*á\*á\*á\*á\*á\*á\*á æ)åÁ^•][}•^Áţ æ`Ás^Á\*[, ĔÁZ`¦c@'{ ['^Éás]åã;ãa`æ4Å, ^||•Á,^æ4Á©2Á;cæ\*}æaāţ}Á[}^Á; æ`Ás^Á\*â\*á\*á\*á\*á\*á\*á\*á\*á ĝ ÁÔUÔÁs[}&^}dæaāţ}•Ás`¦ð]\*Á[{ ^Á;[ð]orÁsjÁsāt ^Éáse Ás@Á;|`{ ^Á @ásorÁsjÁ^•][}•^Áţ Ás@ea)\*^•ÁsjÁ ]`{ ]ð]\*ÉÁ

Group 2: Plume Edge Wells.Á/@āÁ[}^Á§j&|čå^•Á,^||•Ás@æd&^~āj^Á@A\*å\*^•Á; Á@A,|č{^Á&[}}\*¦æåð}}óÁ [~Ás@Á/ÕÜÙÈÁ/@•^Áæd^Á,^||•Á,ão@Á[, Á&[}&^}dæaā;}•Á; ÁxUÔ•Á0;^••Ás@a)Á<del>F€€</del>Áµ\*EŠDÁs@ædÁ,ä|Á§jåã&æe^ÁæÁ ¦^åč&aā;}Á§jÁ;ç^¦æ||Á||č{ ^Áã^ÁsaÁxUÔÁ&[}&^}dæaā;}•Á&[}cā;č^Á&[Ás^&]ā^ČÁ

#### Á ةUÔŒŠÁŸÒŒÜÁGEFJÁŒÞÞWŒŠÁÚÒÜØUÜTŒÞÔÒÁÜÒÚUÜVÁ

å[,}\*¦æåå}ơ4(,~ká@A>ÓÔÕÜÙÈÁ/@áA\*¦[č]A(@,č|åÁ@\])Aå^{[}•dæe^A5([]+[ç^{ ^}ơ4ač^A5(A))Aá(, ká@AXUÔA(, æ•A ¦^{ [çæ4Aá^Ax@A>ÓÔÕÜÙA(,ç^¦A64(,^Ébe);æ4(\*[č•A4(,AÕ¦[č])AfAbe);åAx@A/ÕÜÙÈA

*Group 4: Lateral Sentinel Wells*.Á/@•^Á&~Á&~Á&~A<sup>\*</sup>&~<sup>\*</sup>, ^||•Á<sup>\*</sup>[]}\*¦æå都}o4, Á©Á/ŐÜÙÁ@eeséd×Á<sup>\*</sup>, ^[}åÁ@A &`¦|^}of,|`{^Á<sup>\*</sup>[`}åæa?•ÈÁ/@•^Á, ^||•Á, @`|åÁ@|]Á®a^}œîÁæ\*^ÊA}^c]^&c^åÊA &[}<sup>\*</sup>:æaā}ÊA`&@**ée**áséA`@äc3;\*Á<sup>\*</sup>; /Á¢] æ}•ã;}Á<sup>\*</sup>, Á©Á,|`{^Á©[`}åæ\*ĚA

 $\begin{array}{l} Group 5: Global Plume Mass Wells. \acute{A} (@ \acute{A} [`] £ 34 &` \acute{A} = \acute{A}$ 

*Group 6: Jordan Wells*.Á/@´A`¦[`]Áij &|`å^•ÁæļÁ₹[¦åæġ Áţ[}ãţ ¦ậ \*Á, ^||•Éðæ ÁÚ¦æālā\*Áŝ`ÁÔ@ā\*}Á, ^||•Á }^• c\*åÁ, ãr@Áæ@{Éáæj å Á¤ÓT ÁY ^||•Áऄ+HÉÁ\IÉÁ\IÉÁQ á&j åÁ\ÎÉÁ/@ Áş &|`•ãţ}Áţ Á&@ÁÚ¦æālā\*Áŝ`ÁÔ@ā\*}Á, ^||•ÁārÁţ Á ~æ&ājāææ\*Á&[{]æbj å Á¤ÓA(^} å•Áa^c, ^^}ÁūÁæj å Ás@Á₹[¦åæj Áţ[}ãt[¦ã]\*Á, ^||•ÁæzÁœ•^A[&ææāj }•ĚV@ārÁt¦[`]Á ;ãĮÁ@|]Áãa^}cã^Áæj^Á&@æj\*^•Ã;Ás@Aj|`{ ^Áţ &&`¦¦āj\*Áş Ás@Á₹[¦åæj Áş[¦cāţ}}Áţ Ás@Áæč ã^¦ÉQEååãaāţ}æjÁs^œáÁ [}Ás@Á, ^||Á\*¦[`]•Áæj å Ásaj æţ°•ã ÆsAj¦^•^>} c\*åÁş Ás@ÁUWFÁ/^&@ja&æjÁT ^{{[¦æj å`{ É¥T[åãa&ææāţ}}Á£FÁæj å Á C¢]]^}åã;ÁÖÈEĚÁ

Væà |^Á+ËC-Á; !^•^} or Ác@ ÁØŸ ÁGEFJÁ; [`}å, æz^; Á`æţāĉ ÁåæææÁ{; ¦ÁUWFÁ&[||^&c^å Áţ Á`]][¦ók@ Á cææā cā&æţÁ æ)æf`•ā Áå^ç^[[]^å Áa`Á@ ÁUWFÁ/^&@; 38æţÁÕ;[`]ĚA`ā q[¦38æţÁVÔÒÁ&[}&^} dæaā} + ÁsæÁsb; ^Á ^||Á&æj Áa^Á çā`, ^å Á§ Ác@ ÁCEJ]^}åãzÁÖÁÕ;[`}å, æz^; ÁÛ`æţāĉ KÁU!\*æj 38ÁÖæææÁ]¦^æå•@^óÆj &|`å^å Áţ}Ác@ ÁØŸ ÁGEFJÁOEÚÜÁ &[{]æ\$oÁsã & &ÉA'@ Á cææā cā&æţÁsb; æf`•ā Á§ ÁCEJ]^}åãzÁÖÈcA{[||[, •Ác@ Á{[;{} æzÁs^• & &;ãa^å Áşi Ác@ ÁUWFÁ/^&@; 38æţÁ T^{[:]æjå`{Áæj å ÁT[] åãã&ææã}}ÅÅFĚÁ

Væà |^Á HÉHÁ\* `{ { æð ā ^• Á@ Ár cææðar cæðadd Á ^• `|or Á[¦Áde||Á\*¦[`]• ÉÁ+[{ ÁCH]] ^} åðar ÁÖ ÈEÉÁ ^ 4 ^ & caða \* Ás@ Ás ææd & [||^ & cr å Ás c@[`\* @ÁØŸ ÁGEF J ÉÁ/æà |^Á+HÉHÁS] &|` å ^• Ás∂ Ásæ• ^••• { ^} cf₄ Ás@ Ár cææðar cæðad Ás@ ^• @[ å• Ás@æd Á ^¦^ Ásta \* ^¦^ å ÁsJ Ás@ Á æð æf • ēr Ásða å Ási ða Á&[ { { ^} or Ássá å i ^•• ē} \* Ás@ • ^ Ás@ ^ A @ A cææða cæða Ás@ ^• @[ å Ás ææd Ás] ^ æð å Á@æç ^ Ás6J & i ^æ ē] \* +f₄ i Ás/a[ Ár ði } ã æða) chát ^} å• Áse ^ Asa & \* • • å Ási æ & \* • • ē[ } Át - Át c@ i Á ^ ||• Át i Ás ^ ||Á \* ;[`] • ÉÁ ^ ~ i Ást Ás@ Áz9 Å GEF I ÁCEÚ Ü ÈÁ

#### $\underline{\tilde{O}|[\ \ ]} \stackrel{}{AGAQU|}{\leftarrow} \{ \begin{array}{c} A\dot{O}a^* & A' \\ \end{array} \\ \stackrel{}{\to} \underline{O}a^* & A' \\ \hline A & A' \\ \end{array}$

€ WÌ Ï Ï ÁÇÞ[ ÁÙāł } ãa38æ) óÁ/¦^} å DxÁÁ/@ Át/} å ÁsceÁs@á Á ^||Á@æ Áj ¦^çāj \* •|^ Ásu^^} Ásu^} cãa? å Áse Á cæai / ĚA/ @ğh Á ¦^• \* |œ Á@æç^Áçæiðr å Áf^•• Ás@æ) ÁFÈEÁµ\* EŠÁÇa^ç ^^} ÁÉÈH Áµ\* EŠÁsði å ÁFÈHÁµ\* EŠDÁ āj &^ÁCEEÍ És@ Á\*; |ææ38Æj & k-æ• • Á æ) å Ásu^& / æ• ^• Æj Á/ÔÒÁ&[ } &^} dæaāj }• Æj ç^¦ Ás@ Á ^æ\* Á@æ Á^• \* |c^å/Ej Ásu⁄@ã @kujuĒçæj\* ^+Ænj å Ás@ • ÁsuÁj [ Á • ði } ãa38æj ók!^} åÆj < Cal { ^Æj ¦Æs@æ Á, ^||ÈÁ</p>

 $\underline{\tilde{O}}_{[[]]} \hat{\mathbf{A}}_{\mathbf{A}} \underline{\tilde{A}}_{\mathbf{A}} \underline{\tilde{O}}_{\mathbf{A}} \hat{\mathbf{A}}_{\mathbf{A}} \hat{\mathbf{A}}} \hat{\mathbf{A}}_{\mathbf{A}} \hat{\mathbf{A}} \hat$ 

€ WÌ€GÁÇÞ[ÁÛðł}ãa38æ); óÁ/¦^}åDÁÁÔ[}&^}dæaði} •Á; ÁVÔÒÁsecÁs@ãÁ; ^||Á@æç;^Á&[}•ã:c^}d^Ási^^}Ási^|[, ÁGÁµ\*EŠLÁ c@:¦^-{¦^Éáscé%jd[Á:ðł}ãa38æ); óÁ:d^}å+Á^•č|óÁsiA;[oÁ; Á&[}&^!}ĚÁ € WÌ €Î ÁÇÞ[ÁÙãt}ãa&æ) óÁ/¦^}åDAÁ/ÔÒÁ&[}&^} dæaāt} • Á∞eÁs@áÁ, ^||Ár@[,Á∞é\*\^}^¦æ|^Ás\^&;A;A}åÈÁ
Ô[}&^} dæaāt} • Á@æç^Ás\^^}Ás\^c, ^^}Át€Áu\*EŠÁet}åÁOOEÁu\*EŠÁAjt&^ÁOŸÁOEFFÁet}åÁ@æç^Á\^ç^|^åÁt, ~Á∞é[`}åÁt€Á
(f Át€Áu\*EŠÁ§tÁ^&^}oÁ\*æt] |a)\*Á^æte ÈÁ/@átÁ, ^||ÁarÁstÁc@áÁUVFÁ,|`{ ^Atŏ • ó4s[, }Á\*!æåå}oÁ'[{ Ác@A/ÕÜÙÈÁ

#### <u>Õ¦[ĭ] ÁÌÁQR[¦å[}ÁY^∥•D</u>AÁ

€IRÌIJÁÇQ,&¦^æ-āj\*DAÁV@árÁ,^||Á@eæåÁ@árd[¦&Bæa4|^Áa^^}ÁæÁ,[}Ëä^c%&cý,^||ĚVÔÒÁ,æ-ÁEĒĽÁµ\*EŠÁAB,ÁØŸÁGEFĨÁa; bč{]^åÁq[Á JÁµ\*EŠÁBJÁØŸÁGEFĨĚ4/@/Á&{}&^}cæaāj}Áå^&k'^æ-^åÁeētæaBjÁBJÁØŸÁGEFĨÁq[ÁFÈEHÁµ\*EŠÁBJÁA]\*EŠÁBJÁ ØŸÁGEFJĚ4Ô[}cāj`^åÁeBJ}čæ4Á,[}ãq[¦āj\*ÁasÁeB]¦[]¦ãæc\*Áq[Áč¦c@°¦Á%çæ4čæc\*Áq2,ác@/ÁUWFÁ,|č{^KasÁA;@ácāj\*EÅ

#### <u>Õ¦[`]ÂÂÁQÞ^•ơàÁY^||•D</u>AÁ

€IWÌÍÍÁÇQ & ^æe āj\*DAÁV@erÁ, ^||Á@eeêá@erd[¦a8æe||^Áa;^}Å[]Ëä,^cr&oAá) cāļÁØŸÁOEFFÁ, @}Á/ÔÒÁ, æe Á+Áµ\*ESSÈÄ Ô[] & ^} cræeā] • Á@eçr^Áæej \* ^åÁ¦[{ Á+Áµ\*ESSÁt[ÁOFÁµ\*ESSÁt[āj & ^ÁØŸÁOEFFÁæ) åÁ&[] cāj`^åÁæ)}`æ‡Át[] ãt[¦āj\*ÁærÁ æ]] ¦[] ¦ãæerÁt[Áč¦c@;¦Árçæ]`æerÁqQ, Ás@:ÁUWFÁ;|]`{ ^ÁærÁn @aacā]\*EÁ

€ WÌÏÏÁÇÞ[ÁÛðî}ãaBæa) oÁV¦^}åDMÁÔ[}&^}dæaði} •Á(-ÁVÔÒÁsecÁs@ãÁ,^||Á@æç;^Á&[}•ã:c^}d^Ási^}Ási^|[, ÁCÁµ\*EŠLÁ o@e¦^-{¦^ÉáscÁ%jd[Á:ði}ãaBæa) oÁsi^}å+Á^•č|oÁsiÁ;[oÁ(-Á&[}&^!)ÈÁ

€I WÌ Ï JÁÇQ & \^æe āj \* DAÁ / @ á Á ^ ||Á@æå Á@ã q[ \ & add)^ Ás ^ \ Aj [ } Ëå ^ c \* & A´ \ daAØŸ ÁGEFÍ Á @ \ AVÔÒÁ æ Á Áµ\* EŠEĂ Ô[ } & ^ \ daæāj } • Á@æç ^ Áæj \* ^ å Á\[ { ÁHĚ Áµ\* EŠÁţ ÁGE Áµ\* EŠÁ āj & ^ ÁØŸ ÁGEFFEZ / @ A´ \ ||Á® Á[ & æe å Ás[ ] } \* \ add add) > d ~ [ { ÁEI WÌ I Ï ÊÅ, @ & @ é@æ Ás@ Á@ã @ • oÁ/ÔÒÁ&[ } & ^ \ dææāj } Áţ ~ Aæj ^ Áţ ~ • ãe ÁV] ] ^ \ ÁVJ ãA Áş ^ ||ÈÔ[ } dj ` ^ å Áæj }` add { [ } ãt | âj \* Ás Áæj] \ [] \ äæe Át Á` \ c@ \ Á`ç a#` æe ÁQ , Ás@ ÁJ WFÁ, | { ^ Ásr Á @ add; \* EÁ

#### $Uc^{+}$

Øãç^Áæáåãā] }ækk@^•@ |åÁklā\*^¦•Á, ^¦^Áãa^} cãð\*åÁ§ ÁØŸÁŒEJÁæçÁ, ^||•ÁEIWÌ€ŒÆEIWÌ€ĨÉÆIWÌÍÍÉÆIWÌÏÍÉÄ æ)åÁEIWÌÏJÈEÖä&`••ā] }Á, -Á•cæà|ã@åk@^•@ |åÁklā\*^¦•Á&æ)Áà^ÁĮ`}åÁ§ Á© ÁØŸÁŒETÎÁŒUÜÈ4@•^Á dā\*^¦•Á@ã@å@áA]^&ãã&Áe&~æ Á, -Á©A, |`{^Áœekée^A&@e)\*ā]\*Á;c^¦Áā] ^ÈA/@áAĉ]^ÁÇETÎÁŒUÜÈ4@•^Á dā\*^!°A&cåÁ§ Áæáæ\*^Æ[{]|^¢Á[], Á^•c{ Á`&@éæ ÁUWEÈ4@Á@^•@|å•Áklā\*^!^åŧ[Á][cÁ`\*\*^•céa)Â ^¢]^&c°åÁ§ Áæáæ\*^Æ[{]|^¢Á[], Á^•c{ Á`&@éæ ÁUWEÈ4@Á@^•@|å•Áklā\*^!^åŧ[Á][cÁ`\*\*^•céa)Â ]¦[à]^{{•Á}ã@ÁœÁA{\*^6c}{^âæ¢Á\*^C{}}[]^åŧ Á@áAŝ][ç^{{ }}eA åææá{ ^^céaá§ ÁœÁæá\*A&[{]|^¢Á[], Á^•c{ A`&@éæ ÁUWEÈ4@Á@^•@|å•Áklā\*^!^åå&[Á][ćA`\*\*^•céa}Â ]¦[à]^{{ •Á}ã@ÁœÁA{{ ^âæ¢Á\*}c?}[]^âŧ Á@áAŝ][č{ }}eA åææá{ ^^céaé}§ ÁœÁæá a&æákkiæ^; åææá{ ^^céaé}§ ÁœÁA{{ ^âæ¢Á\*}c?}[]^âŧ Á@áAŝ][&`{ }}cA åææá{ ^^céaé}Â[&];[\*!^•eAŝ]á@A UWEÁæčăA{•UWEÁ]`{ ^Áã Áœá}Â[^;]e3`ā]\*Á§]]![ç^{{ }}cA`\*A

#### < ck 'a i W( 'JC7 'a Ugg'\ Ug'VYYb'fYa cj YX'fUh'YUW( 'k Y``UbX'hchUł3 '

27a<sup>\*</sup>¦^Á+ËJÁ @[, •Ás@ Ásay}<sup>\*</sup> ædÁXUÔÁ(æ •Á^{ [ç^åÁÇ'¦æ] @át]DÉsay}<sup>\*</sup> ædÁ,<sup>\*</sup> { ]ā}\*Áç[|<sup>\*</sup> { ^•Ésay}åÁsay}<sup>\*</sup> ædÁ {æ•Á^{ [çædÁs, ^¦Á}ãsáç[|<sup>\*</sup> { ^Á,<sup>\*</sup> { ]^åÁ;ā}&^Áo?<sup>\*</sup>ÁFJJÏÁÇ @}ÁrÓTÁÅFIÁ,æ•Ási¦[<sup>\*\*</sup>@át}]ā^DÉATæ•Á ¦^{ [çædÁs, Áo?<sup>\*</sup>ÁOEFJÁ,æ Ásā;āædÁtÁt, Á:æ•Á^{ [çædÁs, ¦ā]¦ÁttÁs@ Á^{ ^å^Ásā;^Ë<sup>\*</sup> dÉss^•]ãcÁs@ Áç[|<sup>\*</sup> { ^Á ]<sup>\*</sup> { ]^åÁsa^ā}\*Át[, ^¦Ás@eyÁstÁt¦A; e<sup>\*</sup>A<sup>\*</sup>Ase•ÉdŐ^}^¦æ]<sup>\*</sup>Éttæ•Á^{ [çædÁ@eeÁsa^}ása,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa,<sup>\*</sup>Asa

#### Á Ø©ÙÔŒŠÁŸÒŒÜÁG€FJÁŒÞÞ₩ŒŠÁÚÒÜØUÜTŒÞÔÒÁÜÒÚUÜVÁ

&{}•ãrc^}cÁ,ãc@Á;à•^¦ç^åÅå^&¦^æ•ã;\*Ás'^}å•Á{{¦Á/ÔÒÁ§iÁJWFÁå^^]Á\*¦[`}å,æe^¦ÉA`\*\*^•c3;\*Ás@æoÁæĕ`ã^¦Á ¦^•q{¦æeã;}Á§iÁ¦:{\*¦^••ã;\*ÈÁ

### 5 fY`UbmWYUb[Yg`cf`UXX]hjcbU`UWhjcbg`fYei]fYX`Zcf`h]g`fYaYXmWcadcbYbh3Á

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# 4Á CD9F56 @9'I B+H'& 'G<5 @@CK 'GC=@5B8'8I AD'G+H9G'

$$\begin{split} & \forall @ \ \ \ A = J = A \ \ A \ \ A \$$

V@[`\*@k@ ÁUWGÁÜ^{ ^åãæ‡ÁQ;ç^•cāt ææā[} B20ÙÁ;¦[&^••ÉDùãx^•ÁDEÁÔÉÉDÉAPÉAFGUËHÉAe)å ÁFFGUĔIÁ\_Å^\^Á[`}åÁ{[Á @æç;^Á§[[¦\*æ)3&Áæ)å Á{;¦Á;¦\*æ)3&ÁÔUÔ•Áæà[ç^A &@ Á&]~æj`]Á[[懕Á]^&ãæ3åŧÁ/æà]^ÁFA[Á® ÁFJJÏÁUWGÁÜUÖÉA W}]^¦{ãæ^åÁæ)å -ã{|•É4,¦Ás`{]•É4, ^¦^Ásã^} cãæ3åÅ,ãc@3,ÁDãx^•ÁDEÁÓÉÓÉAPÉAe)å ÁFFGUËFÍÉA/@ ÁFJJÏÁUWGÁÜUÖÁ CJæ\*AÆDÅs^•&¦ãa^•Á;ð]^Á^{ ^å^Á&[{][}^} eÁtÁsåå¦^••Á®A`@æ‡[[,ÁE[ðÁsa)åÅs`{]Áãx°•ĚA

V@ ÁUWGÁÜUÖÁOĘ ^}å{ ^}óÂGÁÇƏ€€JDÁæåå¦^••^åÁ @eqh[ ֻÁ\*¦[ `}å, æe^¦ÁæaÂÚãe^ÁDÊÁ, @B&@Æá Áåãa &`••^åÁ5jÁ Ù^&eqā}}Â ÈÉÁ

- V@ ÁUWGÁÜUÖÁCĘ ^}å{ ^}ơÀHÁÇG€€JDÁse-^&c^åÁs@ Á @ed|[, Á[āļÁsa)åÁsĭ {]Áã^•ÁşiÁ[ĭ¦Á¦ã;&ã]ædÁ,æê•KÁ
- FĚÁ UWCÁÜ UÖÁQĘ ^} å{ ^} cÁÀ HÁQ E JÁN [&`{ ^} cå É A chi
- HĚÁ UVCÁÜUÖÁQĘ ^}å{ ^}ďÁHÁGĐE€JDÁs[&`{ ^} c\*åÁāja¢AÁ { ^åð\*•Á[¦Áāg∿Á ãx••Ájão@á[ā/áţ]]as&orák@æeÁ,^¦^Á }[dálājæ||^Áaj&|`Áaj&|`á%åÁajÁc@ÁFJJÏÁUVGÁÜUÖKkŐ|^}æså^ÁÜæ)\*^ÉÁUča]\*ÁÜaj\*AÜæ)\*^ÉÁFHÍÁÚVOEÁ Ù(q'¦{ azc^¦ÁÖãa&@ÉV!æjÁÜæ)\*^ÉbejåÁYæc?¦Á/[,^¦ÁQE^æb&OāAó@e^^Áãx•ÉÅ\*ã@e\Á¦¦^çãjč•Á^{ [çæbÁ æ&caj})•Á@æá/ka^^}ÁS[{]|^c\*åÁs@æeÁ^åč&^åÁ[ā/át]]æ&orÁt[Ás\|[,Á&|^æ)č]Á^ç^|•É4[¦Á5jç^•cãtææāj}•Á@æáÁ å^c\*¦{āj^åÁx@æeÁ,[Ász@etÁ]}Á[¦Á;[Áč¦c@¦Áse&caj}}Á;æA,^^åÅEV@ÁQE\_^}å{{}}å{{}}
- - •]^&ããààÁ§JÁx@A/æa)àÁ`•^Á&[}d[|Á^{ ^åãæd/åa^•ã\*}Á\$ŠWÔÜÖDÈÄ

ڬÙÖÁÀFÁārÁåār& ••^åÁajÁ<mark>ù^&caj} ÁÇÙã¢ÁŒA @eo|[</mark>ِڴ;|[`}å, æe^¦DÉÀ<u>^&caj</u>}ÀJÁÇÙã¢ÁSÁ @eo|[ِڴ;|[`}å, æe^¦DÉA æ)åÂ<mark>ù^&caj}ÁFGÁ</mark>ÇUWGÁ&^^]ڴ;|[`}å, æe^¦DÉÁ V@ÁUWGÁÜUÖÁQĘ ^}å{ ^}œÁIÁQƏEFGDÁ, æÁāT}^åÁBjÁRæ) ĕæŕÁQEFGÁag)åÁ&[& `{ ^}œÁ; !^çāį `•|^Á&[{]|^c^åÁ •[ā¦Á^{ [çæ]/Aæ&cāi} • Á&[}å čcå Á∞aký, [Áãc\*•kAv@ÁHÍÁÚVOEÆ)åÅÛãc ÁSÈAÞ[Á`; c@;!Áæ&cāi}/Ásā Á^č ǎ åÅ[; ká@A •[ā]•Á[&ææ^åÅ,^æÁx@Áx@ Áx&æ;ææāi} Ást-^æ Á∞ak@•^Áç, [Áãc\*•LÁxQ `\*@kw@ Á\*¢&æçææāi} Ast-^æÁ[; ká@ÁHÍÁÚVOEÆ [&æc\*åÅ,ãx@3jÁx@Ást-^æái, -Áx@ÁQEå^}APā]•ÁQE{ ^Á/;æājāj \*ÁUãc Áx@æxÁ@æ Á^•c3&c\*åÁ&[{ { ^;&ãæ¢Á\*•^ÈA/@ÁUWCÁ ÜÜÖÁQE; ^}å{ ^}cÅiÁQEFGDÁst[Ásà; ^•-^åÁBjÁÛ~&cāi} ArFEÉA

V@ÁUWGÁÜUÖÁQĘ^}å{^}œÁİÁQƏEFIDÁ, æeÁā³}^åÁşiÁTæ&@ÁQƏEFIÁæ)åÅs[&`{^}oA∫;^çā[`•|`Ás[{]|^c∿åÁ •[ā;Á^{ [çæ‡Ász6aī]}•Ás[}å`&c^åÁsceÁ[ā;Ásch^æeÁ;Ás[}&^;}Ásch?&c^Aásc+KAÛãc^ÁQEÁs@Á?æec;}Á,[¦cāī]Á;ÁsceÁ FHÍÁÚVOEÉæ)åÁs@ATÞOEÜÞŐÁOÓÚÁQE^æEKQÁsteP[Ås[&`{^}orÁsceaKŠWÔ•Ásc=^Á^``ã^åÁsceÁs@•^Áāsc+ÉÁ

# ('% FYa YXm7 ca dcbYbhg', %h fci [\`.-.`Gc]``FYa YX]Uh]cb`

## ("& FYa YXm7ca dcbYbh %. @bX`l gY`7cblfc`g

#### DYfZcfaUbWY'GHUbXUfX'flck'Xc'mci'\_bck'k\Yb'mciBY'XcbYL'

Q) ãããe‡Áā[] |^{ ^} cæcā[} Á, æ• Áå[}^Á, @} Ás@ ÁNÙÒÚCE5ae) å ÁT ÚÔCE5, ![çãā^åÁ&[}•ãrc^}& `Áæ]] ![çæ‡Á[¦Áæ) ÁU WGÁ ŠWÔÜÖÁå[& `{ ^} cEÁQ] |^{ ^} cæcā[} Á, äļÁ&[}cā] `^Á5g å^~ājãc^|^Á}|^•• Á` ¦c@ ¦Áæ&cā[} Áse Áseà ^} Ás@æe5, [`|åÁæ‡|[, Á -{¦Á}|ã[ãc^åÁ •^Áæ) å Á`} ¦^• clã&c^åÁ\*¢][•` ¦^ÈÁ

#### < UgʻUʻ@; 7 F 8 `Xc Wia Ybh'VYYbʻUddfcjYX`hcʻUXXfYggʻ@; 7 `]ggiYgʻZcf`CI&zUbX`]gʻ]h'VY]b[ʻ ]a d`Ya YbhYX3ʻ

Ÿ^•ĚÁ/@ ÁNÙÒÚŒ£anjåÁT ÚÔŒ£j¦[çãa^å&K[}•ãrc}&î kānj]¦[çæn¦Á[¦Ác@ÁUWCAŠWÔÜÖA5jÁÙ^]c^{à^¦ÁOEF€AanjåÁ ãaÁ@ær Áa^^}Áāj]|^{ ^} c\*åÅa^Ác@ÁŒ{{ ÈĂU^çãraj}Á Á (ā -Ás@ÁUWCAŠWÔÜÖÁ, ær Áanj]¦[ç^åÅa^Ás@ÁNÙÒÚŒ£anjåÁ T ÚÔŒ£5jÁOE \* \* • cÁOEFÎÈÁ/@árÁ^çãraj}Á^|ājæc\*åÅ[ājÁŠWÔ•Á¦[{ Ás@Ánlì EЁæ&¦^Á&c\*æakiæ)• ~ ¦\^å⊕^ær^åÁq[Á Üæq • ^ ÂÔ[\*}c\*á5jÁOEFHÁang[}\*Ás@Á, ^•c\*¦}Áa[\*jæc\*åÁ[aňáChUWCEŽŒAq[cæn|A[A]CEiA&&¦^•Áœq;^Áa^^}Á dæ)• ~ ¦\^å⊕^ær^åÁq[ÁÜæq • ^ ÂÔ[\*}cÈÈ/@Á[ājÁŠWÔ•Á, \^Ár|ājæc\*åÁ[#[]]]® \*Á[ājÁ&|^æj\*]Á[ájÁQ</br>
Á Ø©ÙÔŒŠÄŸÒŒÜÁG€FJÁŒÞÞ₩ŒŠÁÚÒÜØUÜTŒÞÔÒÁÜÒÚUÜVÁ

#### K UgʻUbʻUbbi Uʻg]hhʻ]bgdYWhjcbʻZcfʻ@r7gʻWcbXiWhYXʻ]bʻ:Mi&\$%3ʻ

Ÿ^•ÈAU}ÁR`}^ÁFJÉAGEFJÉAG@ÁCEE{^ÉATÞCEÜÞŐÉ&ee)åÁRXÁ&{}å`&cvåÁx@Áee}}`æ¢A§•]^&aa†A§•]^&aāţ}Áţ~ÁUWCA\*áz\*•ÈÁ/@Á &@&&\[ãrcÁs@eeeÁ, ærÁ&[{]|^cvåÁs`¦āj\*Áx@Á§•]^&aāţ}ÁsāÁsg&{`å^åÁæe ÁCE]]^}åã¢ÁøEÁ

### 8]X'h\Y`]bgdYWhjcb`]XYbhjZmUbmiZc``ck!id`UWhjcbg`bYYXYX'hc`aUjbhUjb`h\Y`dfchYWhjjYbYgg`cZh\Y` @:7g3`

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# 5Á CD9F56 @9'I B+H'& '899D'GC=@G+H9G'

∠[¦Á,`¦][•^•Á, Ás@∘ÁFJJÏÁUWGÁÜUÖÉÜão∿•ÁÖÁæ) åÁÕÁ, ^¦^Á&[}•ãå^¦^åÅå^^]Á[ā)Á ão∿•Áà^&æĕ•^ÁXUÔÁ ā[]æ&orÁ¢cơ}å^åÁų[Áå^]c@/Áa^ç, ^^}Á.€Áæ) åÁFÏ€Áo^dÈÙ[{ ^Á∞ååããā[}æ4Á@æ4|[, Á[ā)ÁÔUÔ•Á, ^¦^Áæ+p[Á ]¦^•^}oÁ∞aÂÙão^ÁÕÉæe) åÁÙão^ÁÕÁæ+[Á&[}cæa],•Á∞áåč{]ÈŹV@/ÁFJJÏÁUWGÁÜUÖÁQ;æ\*^•ÁGÁq;ÁrDÁå^•&¦ãa^•Á^ç^}Á ¦^{ ^å^Á&[{ ][}^}oAqtÁa^Áa[]|^{ ^}c^åÁ{[kô@•^Áç][Áão\*•Ká

Ü^{ ^å^ÁÔ[{ ][}^} 0ÁĤFkkŐ¦[`}å, æe^\'ÁT[}ãt[¦āj\*Á

Ü^{ ^å^ÁÔ[{ ][}^} 6ÁGAÚ`^•d & BAÛã^ÁŒB&^••ÁÇÖ`¦āj\*ÁÜ^{ ^åãe‡ÁŒBcā‡}•DÁ

Ü^{ ^å^ ÁÔ[{ ][}^} 0 Å HKÛ[ãļÁ Kæ][¦ ÁÔ¢dæ&cā[} ÁÇÙ XÒDÂÙ^• ơ {• Á

Ü^{ ^å^ ÁÔ[ { ] [ } ^} ơÂI KÁÒ} @ee) &^{ ^} or Áξ Ás@ ÁUXÒÂÙ^ • c^{ • Á

Ü^{ ^å^ ÁÔ[ { ] [ } ^ } 0 Â\Í KÁT ænāj cænāj ÁÔ¢ār cāj \* ÁÙãe^ ÁÔæji• Á

Ü^{ ^å^ ÁÔ[{ ][}^} 0ÁĤ kẤT xãng caoãng ÁÙ ʿ¦-xa&^ ÁÔ¦-xãng xat ^ÁÔ[} d[|• ÁÁ

Ü^{ ^å^ ÁÔ[ { ] [ } ^} ơÂ\Ï KÁÔ @eebæ&ec^¦ã ^ ÁÙ @eeþ[[ ¸ ÁÙ[ ‡≉ Áeep å ÁÖ` { ] Á

2[¦ÁÜ^{ ^å^ÁÔ[{][}^} dÂFÊĄ]\*[ā]\*Á'¦[`}å, æơ\¦Á[]āť[¦ā]\*Á,^æóAô@•^Áç[Áāơ•ÁáA[{]|^ơċåÁæ Á,æóÁ, Á UWGÁå^^]Á'¦[`}å, æơ\¦Á[]ãť[¦ā]\*ÁÇ<u>)^&cą</u>]}ÁFGDÁe)åÁã Á[dáaā&`••^åÁ^]æææ^|^Á§JÁc@áÁA&cą]}ÈÜ^{ ^å^Â Ô[{][}^}o AÀGÁt[ÁÀ]Á,^!^Á^|æe^åÁt[Á&[}ca]`^åÁt]^!ææa]}Á,-Ác@ÁÙXÒÁ^•ơ{ • Ás@æeÆœæáÁs^^}Á§J•cæt|^åÁ§JÁ FJÌÎÉÁ @ dÁs[\_}Á§JÁFJJÌÁæ}åÁ`à•^``^}d^Á^{ [ç^åÁ&[]]^ca]\*ÁÜ^{ ^å^ÂO[{]]}}>®ÁAGAťFÁĴÈÁ

Ü^\*ælåði\*ÁÜ^{ ^ å^ÁÔ[{ ][}^}oÁXİ Ésbesláãuāti}ædÁ @ed+[, Á [ðiÁsi, ç^•oātaeati}}Á, [¦\ÁÇI¦Á,[}ËXUÔÁÔUÔ•DÁ, ælÁ &[{ ]|^c^åÁseaAÛãc^ÁÖÉsbet) å A&@edeaesbcc'iãaeati}}Á, [¦\Át, Ás@Aši`{ ]Å, ælÁ&[ ]|^c \* åÁseaAÛãc^ÁÕÉA, @a&@A&[{ ]|^c\*åÁ co@a`Á^{ ^ å^Á&[{ ][}^}déAv@Asi, ç^•oātaeati}}B&@edeaesbcc'iãaeati}}Á, [¦\Át^åAk[Á^{ [çaehAt, Á\*@ed+[, Á\*[ði+ÁseaAÛãc^ÁÖÁ að) å A&[}•d`&ati}}Át -Ásea&[ç^¦ÁseaAÛãc^ÁÕÉA, @a&@Asi, <^}c\*ataeati}}Á, ['\ÁtaeAsi, & c\*ataeati} CO€€JDÉA

Q Á ˘ { { ﷺ ﷺ ﴿ كَفَرُو الْمَعْمَانِ ﴾ ﴿ كَفَرَ حَمَّى اللَّهُ ﴾ ﴿ كَفَرَ حَمَّى الْحَمَّى ﴾ ﴿ كَفَرَ حَمَّى ال كَاسُ كَمْ كَمَانَ ﴾ ﴿ الْمَعْمَانِ أَنْ اللَّهُ عَمَانَ ﴾ ﴿ كَانَ مَعْمَانَ ﴾ ﴿ كَانَ الْمَعْمَانِ ﴾ ﴿ كَانَ ك كَاسُ كَمَانَ ﴾ ﴿ الْمَعَانِ إِنَّ هُمَانِ ﴾ ﴿ وَالْمَعَانِ ﴾ ﴿ وَاللَّهُ إِنَّ اللَّهُ عَلَى اللَّهُ ﴾ ﴾ ﴾ ﴿ أُ

Á

Á

# 6Á CD9F56 @9'I B+H'& 'G+H9'5'G<5 @@CK'; FCI B8K5H9F'

Ù@eļ[, Á':[`}å, æe^\ÁæeÂUãe^ÁOZÉ@eze-Ási^^}Á§[]æ&e^åÅs^ÁXUÔ•ÁsejåÆsejæ[]^ÈÉ/@Ai^|^&e^åÁ\{^å^ÁşiÁ@eÁ FJJIÁUWGÁÜUÖÁşi&[¦][¦æe^+Ás@Á\*^Áţi\_\*}å, æe^\Ák¢dæ&cāi}}Ár\*ec^{EJ, @B&@Asi\*æjÁţ]^¦æeāi}ÁTæâÁHFEÄ FJJIÈY@}Á[]^¦æeāj\*Ê£s@Á\*\*ec^{ Á&[}ç^^^åÁ\*¢dæ&e\*åÁ\*![`}å, æe^\Ák[Ás@Á\*æjāzæ\*ÁA^, ^\ÁL[¦Áshæeati}} æÁU`à]&&|^ËU\_}}åÁ/!^æeati}Af\_Caceati}Af\_CASEC\_åA\*eCla&er åA\*;c@¦Ásār&`••^åÁsh[]ES@Á\*![`}å, æe^\Á e\*\*ec{Á&Aze\*^åÁt]^\æeati}Af\_Caceáti}Af\_A {[}ãeti]\*áAzee\*}æeati}Af\_Caceáti}Af\_CASEC\_åSeAti}Af\_A

$$\begin{split} & \forall @. ki^{8} \delta @. a_{1} A_{1} [ & \wedge a_{1} a_{2} @ A_{2} @ A_{2} @ A_{2} @ A_{2} A_{3} A_{3} A_{4} A_{4} A_{2} A_{2} A_{4$$

Óæ•^åÁ;}ÁæÆÞ[ç^{ à^¦ÁFFÉ2O€FÍÁ/^&@;38æ4ÁT^{ [¦æ);å`{Ár`à{ãæ^å&î^Áx@:ÁOE{ ^&@æ4&i[&`{ ^}c\*å&@:ÁOŸÁ O€FÍÁ;[}ã[¦ā]\*Á^•`|o-Áæ);åÁ^&[{ { ^}a^å/&@ea)\*ā]\*Áx@A^{ ^å^Á{;ÁT ÞOE25x@:ÁNÙÒÚO2569;åÁT ÚÔOEÁ æ]]¦[ç^å/&@ea)\*ā]\*Áx@:Á^{ ^å^Á{;ÁT ÞOE253;Á?a`Á;Á';[`}å; æe^¦Á^¢dæ3&cā];}Á&;å&@ed\*^È2/@ã:Á&@ea)\*^Á;æA æ]]¦[ç^åÁ§JÁUWGÁÜUÖÁCE[^}å{ ^}å{ ^}œÁÌÁ§JÁxæ|^ÁØŸÁGEEFÌÈÁ/@•^Á\*¢dæskaā[}Á,^||•Áæb^Á§J&|ĭå^åÁ§JÁx@Á {[}ãE[¦ā]\*Á]¦æjÁ[¦ÁÙãxÁCEÉx@¦^{['^Áx@^^Á,ā]|Á[c%a^Á;^æp^åÈĂ

# \* '% FYa YXm7ca dcbYbh ِ%; fci bXk UhYf`Acb]hcf]b[ `

**8 YgW]dh]cb.**Ák©ü¦[`}å, æe∿¦Á([}ãt[¦ā)\*Át[Ád;æ&∖Á),|`{ ^Á(ā\*¦ææā);}Áæ);åÁ^{ ^å^Á,^¦-{¦{ æ}}&^ÈÁCFJJÏÁUWCÁ ÜÜÖÉA);æ\*^Á+DDĂ

DYfZcfaUbWY'GHUbXUfX'flck'Xc'mci'\_bck'k\Yb'mciBY'XcbYL'

Y@}羢j\^¦-{¦{ æ}&^Át¦[`}å, æe^¦Á([}ãq[¦ã)\*Áj¦[\*¦æ{Á@æeÅa^^}Á•cæà|ã@åÁæ}åAj}\*[ā)\*Á([}ãq[¦ã)\*Áā(Å &[{]|ãæ})cÁ,ãc@Ác@Áj¦[\*¦æ{EÁ

#### =gʻh\]gʻfYaYXmWcadcbYbh'VY]b[`]ad`YaYbhYX3`

Ÿ^•ĚÁvæà|^ÂËFÁ`{{ æ3ā^•Á,^¦-{¦{ æ3} &^Á([}āt[¦ā]\*Á^``āl^{^}œÉāt[]|^{^}cā;\*Á,æ3æ?•Éæ3)åÁt[}āt[¦ā]\*Á ]|æ3,Áå[&`{^}œÈA'@AØŸÁQEFJÁT[}āt[¦ā]\*ÁÚ|æ3,Áæ548]&|`å^åÁ3JÁQE]^}àåæ%OEÉæ3)åÅ∞ØAØŸÁQEFJÁ,æe^¦Á`æ4āĉÁ {[}āt[¦ā]\*Á[&ææa1]}•Áæ3)åÁ¦^``^}&&?•Áæ4^Áæ4•[Á`{{ æ3ā^åÁt}}Á2027`¦^ÂËFÉAQE^Á&^çãæea1}}•Áæ4^Á¢]|æ33,^åÁ3JÁ QE]]^}ååçÁÔÉEÉÆ23`'¦^ÂËCÁ;|^•^}œÁ`{{ ^¦ÁQEFJÁ(^æ\*`|^åÁ\*![`}å,æe^\ÅA'|^çææa1}}Á&[}d{``}

### K YfY'l\ Y'[fci bXk UhYf'a cb]hcf]b[ 'fYei ]fYa Ybhg'Zcf'l\ ]g'fYa YXma Yh8'''

Ÿ^∙È

### =gʻUbmi[fcibXkUhYf`gUad`]b[ˈdfcdcgYX`df]cf`hc`h\Y`bYIhfYdcfh8`

Ÿ^• ÉA æ{ ]|ā] \* Á[ -ÁÛãơ ÁOEA ¦[ ` } å, æe^ ¦Á[ [ } ãt[ ¦ā] \* Á, ^||• Á, āļ|Áa ^ Áæ&&[ ¦åā] \* Át[ Áx@ Á[ [ } ãt[ ¦ā] \* Á] |æ) Áb] ÁOE[ ] ^} åãeÁ ODETEĂ

Õ¦[`}å, æc^¦Áræ{]|ā]\*Áţ-Á, æc^¦Á`]]|^Á,^||•Á^|æc\*åÁξiÁæc^¦}æc^Á, æc^¦Á`]]|^Áæ)åÁ,^|Áææà)å[}{^}c^, ac à^ÁşiÁæ&&[¦åæ)&^Á, ão@á^&[{{^}åaæa‡}•ÁşiÁOE]]^}åã¢ÁOEV@Á,^¢o4‰, ætpi¦+Á°ç^}o∱, æ•Á,!^çāţ`•|`Á&@å`|^åÁ -{¦ÁØŸÁOEFJLÁ@Q, ^ç^¦É&s`^ÁξiÁo@Ásã\*&[ç^!^Á;ÁFÊEãaţ¢æ}^ÁşiÁoŸÁOEFĴĚV@Á,^¢o4‰, ætpi¦+Á°ç^}o∱æ¢å`|^åÁ‰, ætpi¦+Á ^ç^}oÁ, æ•Á&[}å`&c\*åÁşiÁØŸÁOEFÍÁæ}åÁ^]^æc\*åÁs`Ás@ÁOE{^ÁşiÁØŸÁOEFĴĚV@Á,^¢o4‰, ætpi¦+Á°ç^}oÆrÁ;[, Á •&@å`|^åÁξi¦ÁØŸÁOEOEÁξiÁ;æäjœæäjÁ©A;[¦{ ætÁ\~``^}&°Á;-Á;}&^Á°ç^¦`Á{;`!Á^æ+EÅ

#### 5fY`Ubm\W Ub[Yg`cf`UXX]h]cbU`UWN]cbg`fYei]fYX`Zcf`h ]g`fYaYXmWcadcbYbh3`

Ÿ^•ÈAQE Áā•oÁ;¦[][•^åÁşiÁ@ ÁØŸÁQEFÍÁQEÚÜÉA;[}ãt[¦ā]\*Á;Á,^ý,^||•ÁEFWHÍ€ÉAEFWHÍFÁÇÒY ËEDÉAse)åÁEFWHÍIÁ ÇÒY ËIDÁ&^æe^åÁşiÁØŸÁQEFÏÈZ/@•^Á,^||•Ásek^Ár••^}cāael|^Á^å`}åæe)oÁ;[}ãt[¦ā]\*Á;[ā]orÁt[Å,^æsà`Á,^||•Á €FWF€ÌÉÆEFWFFÎÉase)åÆEFWFHÌÉA^•]^&caço^|?ÉAF[,^ç^¦ÉÆEFWHÍ€Á,ā]A&aA\*A\*(][¦æs\*Át[}ãt[¦ā]\*Á ][ā]oÁsjÁ;|æ&^Á;ÁEFWF€ÌÁ}cājÁs@Á;à•d`&caţ}Ás@eeA;!^ç^}c\*åÁt[}ãt[¦ā]\*ÁsjÁØŸÁQEFÏÁsæa)Ás^Á^{{[ç^åÉAQEA;A c@Á?}åÁ;Ás@ÁØŸÁQEFJÉAs@Á;à•d`&caţ}Á@eeA;[oás^}á^{{[shar}}á^{{[shar}}

# \* "& FYa YXm7 ca dcbYbh [ ' 5. @UbX'l gY'7 cbffc`g

8 YgW]dh]cb.`V@ÁFJJÏÁUWGÁÜUÖÁÇIæ\*^Á+DÁ cæe\*åkÁkQe•cãčcā[}ækÁk[}d[|•ÁţÁ^•d&BoÁ,^, Á,^||Ági•cæ||ææā[}•Á æ)åÁj:[çãā^Áadex'}æe\*Á æe\*¦A`]]|ð!•Áæ)åÁ,^||Áæàæ)å[}{ ^}o%æe Á,^&^••æ'Å\_ÅØ['Åæ\*^Á, Æ\*\*ª, Å '^` ã^{ ^}o%æe Áa^^}Ási[\^}Ágid[Ač;[Ájið\*&^•ÉÅ, ão@Á©ãiÁ^&cā]}Áf & \*eāj\*Áţ}Ác@ÁŠWÔ•ÈÁUWGÁDÙÖÁÀFÁ &|æåãð\*åÁs@ÁŠWÔÁ&[{][}^}o%atÁgi&[`c\*&aā]}Áţ-Ás@Á\*¦[`}å, æe\*¦Áţ[}ãa['å]\*Áæ)åÁ\*¢dæ&cāj}Á\*^•c\*{ å]+æcdč&cči^ÈÁ Á ØQJÔQEŠÁŸÒQEJÁGEFJÁGEÞÞWQEŠÁÚÒÜØUÜT QEÞÔÒÁIJÒÚUÜVÁ

#### DYfZcfaUbWY`GHUbXUfX`flck`Xc`mci`\_bck`k\Yb`mciBY`XcbYŁ`

Q;]|^{ ^}; cæcāį;}Aį́,-ÄŠWÔĄ́,āļ|Á&;;}cāj`^Á;}cājÁ`&@Asāį,^Ás@excÁ@A\*;[`}å;, æc^;¦A&;;}&^;}d;æcāį;}•Ásd^AsA^[;,Ás@A &|^æj`]Á^ç^|•ÈĂ

### < Ugʻh\Y`A 8 < `]ggi YX`U`GK 7 5 `5 Xj ]gcfmiZcf`h\Y`UfYU`]a dUWhYX`VmiG]hY`5 3 `

Ÿ^•Ê£a•`^åÁR`}^ÁFJJÎÊÁ^çãi^åÁşIÁÖ^&^{à^¦ÁFJJJÁse}åÁQE;¦ãjÁGEFÎLÁQ@\_^ç^¦Êác@•^Á^çãiā[}•ÁsiãaÁ,[cÁse-^&cÁ c@Ás[`}åæ3^Á[¦Ác@ÁUãrÁQE¢a38a]ã?ĚÁ

### < UgʻUʻ@;7F8`XcWiaYbh'VYbʻUddfcjYX`hcʻUXXfYggʻ@;7`]ggiYgʻZcfʻCl&z]bWiX]b[ʻG]hYʻ5ʻ [fcibXkUhYfžUbX`]gʻ]hVY]b[ʻ]ad`YaYbhYX3ʻ

Ÿ^•Ě4/@ ÁNÙÒÚCE£aa)åÁT ÚÔCE5,¦[çãa^åÁ&[}•ã·c?}&î Áae]]¦[çæ4Á[¦Ás@ ÁUWCAŠWÔÜÖÁ5jÁÙ^]c?{à^¦ÁGEF€ÉÁ ]@38:@£a Áa^3]\*Áā[]|^{ ^}c^åÁaî^Ás@ ÁCE{ ^ĚÀŬ `à•^``^}cÁ^çãrā[}•Á[Ás@ ÁUWCAŠWÔÜÖÁ@aaç^Á,[cÁ&@aa)\*^åÁs@ Á ŠWÔ•Á[¦ÁÙãc^ÁCEÉÁ

### K UgʻUbʻUbbi Uʻg]hhʻ]bgdYWhjcbʻZcfʻ@r7gʻWcbXi WhYXʻ]bʻ: Mi&\$%3ʻ

Ÿ^•ÈÁU}ÁRT`}^ÁFJÉKGEFJÉKs@ÁCE{^ÉATÞCEÜÞŐÉben}åÁRXÁ&{}å\*&CråÁs@ÁUWGÁ4ãcrÁen}}`æk4\$j•]^&caj4\$j•]^&caj4\$jéÅ,ãr@ÁseÁ &{{]|^cråÁ&@&&|ãró4\$j&}`å^åÁse ÁCE}]^}àãrÁz0ÈÁ

## 8]X'h\Y`]bgdYWhjcb`]XYbhjZmUbmiZc``ck!id`UWhjcbg`bYYXYX'hc`aUjbhUjb`h\Y`dfchYWhjjYbYgg`cZh\Y` @!7g3``

Þ[ Ă

# \*" FYa YXm7 ca dcbYbh; '6.'5`hYfbUhY'K UhYf'Gi dd`m#K Y`` 5 VUbXcba Ybh

8 YgW]dh]cb.Á/@ÁFJJÏÁJWGÁÜUÖÁÇiæť^ÁHDÁ cæe^•kÁkQe•cãčcāţ}ækÁξ[}d[|•Áξ[Á^•d&bcá,^, Á, ^||Áξj•cæ||ææāţ}•Á æ)åÁ;l[çãā^Áæ¢c';}æe^Á,æe^;[Á`]]|ã•Áæ)åÁ, ^||Áæaàæ)å[}{ ^}ó&e Á,^&<-eæ^ÈhÁQ[;Á^æe^Á, Á&ã & ·•āţ}Eb&@Á !^``ā^{ ^}ó@ee Áa^^}Ási[\^}Ásjq[Áç;[Á,ā\*&^•ÉÅ,ão@ác@a Á^&cāţ}Á{& `•āj\*Áţ}Ác@Áæ¢c';}æe^Á,æe^;Á`]]|ã•Á æ)åÁ, ^||Áæaàæ)å[}{ ^}dĚ

## DYfZcfaUbWY<sup>\*</sup>GHUbXUfX<sup>\*</sup>flck<sup>\*</sup>Xc<sup>\*</sup>mci<sup>\*</sup>\_bck<sup>\*</sup>k\Yb<sup>\*</sup>mci<del>B</del>Y<sup>\*</sup>XcbYL<sup>\*</sup>

Y@}Á,^||Á,}^\•Á,@{Á`æda≎Á@æç^Áa^^}A,~^\^åÁæd,åÁ;[çãå^åÁ,ão@Áad;c^\}æe^Á,æe^\Á`]]|^Áæd,åÐ\A@æç^Á @ensåÁo@āA,^||•Áæda;a}å[}^åÁQ;¦Ás@A,~^\•Á@æç^Áa^^}Á^b&c^åDÀ

## =g'h\Y'fYa YXmWcadcbYbh'VY]b[']ad`YaYbhYX3'

Ÿ^•ĚV@ÁUWFÁŒ¢c'¦}æc^ÁYæc'¦ÁÙĭ]]|^Áæ)åÁY^||ÁŒaæ)å[}{^}oÁÚ¦[\*¦æ{Æa\*Å}å^¦,æÂæ)Å{æ Á\*¢]æ)åÅ q[Á&[ç^¦Áx@Áæ4^æ&æ-^&c\*åÁa^Áx@ÁUWGÁÜã¢ÁŒ4;@æ4|[,Á\*¦[ĭ}å,æe^\Á,|ĭ{^ÈÁU^^ÁÛ^&cā[}Å+ÈÈÁ{¦Á\*¦c@\*¦Á ā]-{¦{æaā]}ÈÁ

#### 8]X'h\Y'VcibXUfmicZh\Y'G]hY'5 'd`iaY'[Yh'UbmiV][[Yf'Xif]b[':M'&\$% žUg'XYZ]bYX'Vmih\Y'%±[#@ Webheif3'

Þ[ĔÁ/æà|^ÂËGÁ;¦^•^}@Á@ÁØŸÁGEFJÁ;¦[`}å, æơ\¦Á`æặã`ÁåæææÁ{[¦ÁĴã<ÁŒEĂ/ŀjā;\*Á@•^ÁåæææÉÆZā`¦^ÂËHÁ •@,•Á@Áx^dæ&@[[¦[^c@}}^ÁÇĴÔĎÆ{[}&^}dæaā]}•ÁæjåÁZā`¦^ÂË Á@,•Ás@Á&ã ËFÊEËä&@[[¦[^c@}}AÁ&ã ĔÁ

#### Á ØQUÔQEŠÁŸÒQEÜÁGEFJÁGEÞÞWQEŠÁÚÒÜØUÜT CEÞÔÒÁÜÒÚUÜVÁ

KYfY`UbmUXX]h]cbU`kUhYf`gidd`mkY`g`X]gWcjYfYX`k]h`]b'h`Y`UfYU`cZWcbWYfb`Zcf`h`Y`G]hY`5`d`iaY` h`UhUfY`Wcad`YhYX`k]h`]b'h`Y`Uei]ZYf`cZWcbWYfb3``

Þ[ 🛱

K YfY'Ubmik UhYf'gi dd`mik Y`g'k ]h\ ]b'h\ Y`G]hY'5 'd`i a Y`gUa d`YX'Xi f]b[ ': M'&\$% 3 ÁZmYgžk \ Uhik YfY' h\ Y`Z]bX]b[ g3''

Þ[Á,^||•Á,^¦^Á;æ;]|^åÈÁ

K YfY'Ubmik Y``ck bYfg'cZZYfYX'Ub'U'hYfbUhY'gi dd`miUbX#cf'k Y``UVUbXcba Ybhi]b': M'&\$%3`

Þ[ 🛱

K]N]b'N Y'G]NY'5 'd`i a YžUFY'N YFY'Ubmik Y``ck bYfg'N Unia YYnN Y'W]NYf]UžVi h\Uj Y'bchmYhVYYb` dfcj]XYX'Ub'U'NYfbUNY'k UNYf'gi dd`n\$''

Þ[ Ă

K ]h, ]b'h, Y`G]hY`5 'd`i a YžUFY'h, YfY`Ubmik Y``g'h, Uha YYhh, Y`W]hYf]UžVi h\ Uj Y`bchimYhVYYb` UVUbXcbYX3Á

Þ[ Ă

=gʻUbmigUa d`]b[ʻcZk UhYfʻgi dd`mik Y``gʻdfcdcgYX`df]cf`hc`h\Y`bYI hifYdcfh8ʻ

$$\begin{split} & \left[ \check{E} A' @ \cdot ^{A} \check{e} e^{A} A \right] \left[ \acute{A} & ee^{A} \dot{A} \right] \right] \left[ \acute{A} & \left[ \bullet \dot{A} \right] & \acute{A}$$

5 fY`UbmiW(Ub[Yg`cf`UXX]IjcbU`UWIjcbg`fYei]fYX`Zcf`I\]g`fYaYXmiWcadcbYbIB`

Þ[ Ă

# \*'(`FYa YXm7 ca dcbYbh;).'Gci fWY7 \UfUWfYf]nUh]cb#FYa YX]Uh]cb'

8 YgW]dh]cb.Áku][` ¦&^Á&@eelæ&cv¦ãæeā]} Đ^{ ^åãeeaã]} +ÁÇFJJÏÁUWGÁÜUÖÉÃ] æ\*^Á+DÈÁ

#### DYfZcfaUbWY`GHUbXUfX`flck`Xc`mci`\_bck`k\Yb`mciBY`XcbYŁÁ

Q[¦Á&@eebæ&cv¦ãææāį}ÉÄ,@}Ás@Á5jç^•cātææāį}Áeej•,^¦^åĄ,^^å^åA;^^ecāį}•Ás[Ą,¦^]æo^Á^{ ^åãeebás^•āt}Á å[&č{^}o•DžQ[¦Á^{ ^åãeeaāį}£Ä,@}Á[ājAÔUÔÁ&[}&^}dææāį}•Áseb^Ása^∥[,Á&|^æaj`]Á^ç^|•Á:]^&ãað\*åÁ5jÁ/æài|^ÁFÁ [Ás@ÁFJJÏÁUWCAÜUÖDĂ

## =gʻh\]gʻfYaYXmWcadcbYbhVY]b[`]ad`YaYbhYX3`

Ÿ^•ÈKÔ@eetæ&cv¦ãæaāį}Å,[¦\Á@ee Ás\^}Á&[{]|^cvåÈAÙq{}^ABÁY^à•cv¦Áj^¦-{¦{ ^å/Aşiç^•cātæaāi}}Å,[¦\ÁşiÁFJJÏÁ æ)åÁv@Á20ājæ4AÛãcvÁ0EAQç^•cātæaāi}ÁÜ^][¦cAQÙqt}^ÁBÁY^à•cv¦ÁO}çã[}{ ^}cæ†Áv@AQ@[|[\*^ÁBÁV^¦çã&>•ÁFJJÏDÁ ;æ Áse•`^åÁÖ^&^{ à^¦ÁFCEÉFJJÏÈÉV@Á^][¦cAsv^[ð]^æevåÁs@A^¢cv}o4j~Ás[co@AxUÔË8[}cæ;ējæevåÁsejåÁ;^œ;e &[}cæ;ējæevåÁ[ā\*Á^``āðj\*Á^{ ^åãæaāi}}ĚÁV@Á[``¦&^Á;AxUÔË8[}cæ;ējæevåÁs[ē\*Á;æA;ě]\*ÁsiAsvAs@A %5JIÍÁ/¦^}&@ÈsÁ

Ü^{^åãæeāį}}Á@ee/Ás^^}Á&[{]|^c^åÈÜ@eçÁO}çã[[}{^}cæ{Áse}åÁQ;⊰æed`&c`¦^ÉAQ;&ÈAÇÙ@eçÉA[¦{^¦^ÁÙd[}^ÁBA´ Y^à•c^¦DÁ&[{]|^c^åÁ^{{ [çæ‡A[,-Á[,-áce†Ë8[]}cæ{ã]æc^åÁ[ā]•Á5jÁOŸÁFJJJÈÓ[]•d`&cã[}}Á[á+Áse]ÁseãA´]æ\*ã]\*Á Á ةUÔŒŠÁŸÒŒÜÁG€FJÁŒÞÞWŒŠÁÚÒÜØUÜTŒÞÔÒÁÜÒÚUÜVÁ

5 fY`Ubm'W(Ub[Yg`cf`UXX]h]cbU`UWF]cbg`fYei]fYX`Zcf`h\]g`fYa YXm'WcadcbYbh8``

Þ[ Ă

# \*') ČjYfU``FYaYXmZcf`G]hY`5`G\U`ck`; fcibXkUhYf`

#### DYfZcfaUbWY`GHUbXUfX`flck`Xc`mci`\_bck`k\Yb`mciBY`XcbYŁÁ

### < Ugʻh\Y`G]hY`5ʻg\U`ckʻ[fcibXkUhYf`fYaYXmVYYb`Wcad`YhYX`f]"Y"z\UjY`h\Y`WYUbid``YjY`g`]b` HUV`Y`%cZh\Y`%-+`CI&`FC8`VYYb`UhHU]bYX`h\fci[\cihk\Y`UYf]U`UbX`jYfh]WU`YIhYbhcZh\Y`G]hY`5` d`iaYh3Á

Þ[ĔÁ/æà|^ÂË5Á;¦^•^}œÁ@ÁØŸÁGEFJÁ\*¦[`}å, æc^¦Á`æţāĉÁsæææke)åÁ@at@at@e Á@Áçæţ`^•Ás@æeA¢&^^åÁæÁ &|^æ)`]Á^ç^|ĔÁ/@Á^•]^&&aç^A&|^æ)`]Á^ç^|•Á,^!^A¢&^^å^åÅs^A&[}&?}dæata]•Á,-ÁsæiEFÉEä&@[i[[^c@}}^Á Ç&aiEFÊEËÖÔÒDÁeæÆFWFHJÁÇFÌ€Áµ\*EŠDĚAÞ[}^Á;-Ás@Á;c@¦ÁÔUÔ•Á\*¢&^^å^åÁs@āÁ^•]^&caç^Á&|^æ)`]Á^ç^|•ÁşÁ ØŸÁGEFJĚÁ

#### K \ Uhi]a dUWhi]g`AB5`\ Uj ]b[`cb`WcbHUa ]bUbhWcbWYblfUhjcbg3Á

] ¦^•^} &^Á; Ás@ Á; ∄ ^¦æáÁ; æť}^cæ?Á§jÁ[∄+ĚÞ-[c^Ás@eeÁs@ Á;¦^å[{∄;æ}joÁs^\*¦æåæaā;}}Á;¦[&^••Ás[^•Á][oÁ %a^\*¦æå^Ás@[`\*@Áş∄^|Á&@[¦ãa^ÊÅ; @3&@Ás;Á[Á[}\*^¦Á;[}ã[¦^åÁseeÁs@árÁ;ã?^}Ás@:Áœá;d;¦3&æ4Áæ&\Á;-Á å^c^&cā;}•Ás@eeÁråák[Ás@:ÁFJJÏÁJWGÁÜUÖÁ;[oÁ-^|^&cā;\*Ás@árÁ&[{][`}åÁseeÁseeÁ©ÛÔĔĂ

Ù ậ) & ^ ÂÙ^] c^{ à^! Á G € Â (@) Á @ Á (& a e í A @ e a e í A @ e í A @ e í A @ e i A @ A &

Ô[}&^}dæaā]}•Á;-Á&ã ËFÊEËÖÔÒÁæaÁÒY Ē Á@æç^Áa^^}Á cæà|^Á;AæA;[}Ĕå^cv&aA;ā]&^ÁÖ^&^{ à^!ÁOEFGÆ} Ô[}&^}dæaā]}•Á;-Á&ã ËFÊEËÖÔÒÁæaÁÒY Ē Á;^æà^åÁŏ•óÆai[ç^Ás@ Á&|^æ)`]Á^ç^|Á§, ÁÖ^&^{ à^!ÁOEFGÆ};åA@æç^Á •cvæåā;Áå^&ka]a^åÁq[Á;]Eå^cv&aÆ;A; ^ÁOEFJĚOEÓÒY Ĕ É&ãã ËFÊEËÖÔÒÁ&[}&^}dæaā]\*Áa{{ Á@eç^Á •cvæåā;Áå^&ka]a^åÁq[,]Eå^cv&aÆ;A; ^ÁOEFJĚOEÓÒY Ĕ É&ãã ËFÊEËÖÔÒÁ&[}&^}dæaā]\*Áa{{ Á@eç^Á •cvæåā;Áå^&ka][, Ás@ Á&|^æ;`]Á^ç^|LÁQ; ^ç^!É&A;AOEFTÁ©AÉA;ACEFTÁ©A&A;A;ACEFTÁ©A&A;A;ACEFTÁ©A&A;A;ACEFGÆ;A;ACEFTÁ©AA;A;ACEFTÁ;ACAETA;ACEFTÁ;A;A;ACEFTÁ;ACEA;A;ACEFTÁ;ACAETA;ACAAA;ACAETA;ACAETA;ACAETA;AC

 $\begin{array}{l} & \left( \frac{1}{2} & \left( \frac{1}{4} \right)^{*} & \left($ 

€FWFÍÌÁ@æáÁæÁj^æáK&ã/ËEÊEEÖÔÒÁ&[}&^}dæaã[}ÁjÁAF€Áµ\*EŠÁ5jÁQE]¦ãµÁQEFFÉ&a`óA@æáAjā&A`áAœàãã^åå à^ç^^}ÁCÌÁæjåÂÏĬÁµ\*EŠÈŽV@Ájà•^¦ç^åÁ&ã#ËEÊEEÖÔÒÁ&[}&^}dæaã[}ÁjÁA`€Áµ\*EŠÁ5jÁR`}^ÁQEFĨÁ\_æÁ@Áã•oÁ ^¢&^^åæj&^ÁjÁ©GÁ&[^æj`]Á^ç^|ÁæcÁEFWFÍÌÁ;ã}&^ÁÖ^&^{à/ÅQEFFÉZV@ÁR`}^ÁQEFÏÁ&[}&^}dæaã[}Á å^&¦^æ•^åÁq[ÁFHÁµ\*EŠÁæ)åÁv@ÁQEFÌÁ&[}&^}dæaā[}Á;æ•Á&[}•ã:c?}o%seo/FGÁµ\*EŠÈÁQ)ÁrX'}^ÁQEFJÁv@Á &[}&^}dæaā[}Á§]&¦^æ=^åÁq[ÁÎÍÁµ\*EŠÉÄ;@3&@éasÁ;^||Á;ãr@3)Áv@Á@arq[¦3&æ4Áæ)\*^ÈÀ/@A[;ç^¦æ4|Ás¦^}åÁseo/ko@arÁ |[&æaāā]}Árcā|lÁæa]]^æ}•Áq[Áa^Árcæaà|^ÈÁ

Q ÁÒY ËFÁc@[`\*@ĤÒY ËIÁQ278I`¦^ÂËIDÉ&[}&^}dæeta]}•Á; Á&ãë ËFÊDËÖÔÒÁ@eqc,^Áa\^}Áœetá;¦Á,^æ4Á;[}Ëå^c∿&cA;ā}&^Á GEF€Á;¦Á\*æejå\*¦ĚQQÁ`{{ ^¦ÁGEFJÉA;æ{]|^•Á,^\^&[||^&c^åÅ{{[ ACY ECA50}}åÁÒY ËHÁQ5;æ{{ }|}ā]\*Á@eerÁa\^}Á åãr&[}cāj`^åÁeerÁÒY ËFÁen}åÁÒY ËIÉeerÁåãr&`••^åÁ5jÁÙ^&ca[}ÂÈDDĚ√@/Á&[}&^}dæeta]}Á; Á&ãë ËFÊDËÖÔÒÁ;æA €ÈTFÁµ\*EŠÁ5jÁÒY ËHÁen}åÁ;[}Ëå^c∿&c45jÁÒY ËDĚÁ

#### KYfY`Ubmilf][[Yf``YjY`g`YIWYYXYX`UhUbmicZh`Y`Webhjb[YbWh``cWUhjebg3`

V@ÁSite A Shallow Groundwater: Monitoring and Contingency PlanÁQY ^}&\ÁG€€ÌàDÁ}[c^åÁc@æáÁāÁc@Á \*¦[č}å, æc^¦Ásiã\*^¦ÁsiÁ\*¢&^^å^åÉs@^^Á^´Á§[}cāj\*^}&`Áse&cāj}+Áse^Á^č ša^åkÁ

- FĚÁ CE{ ^Á, āļ/Á&[ } cæ&c/s@ Á, ^||Á, } ^¦Áæc/ÁFÏ Ì HÁÚāj ^, [[å ÁÖ¦ãç^Á{[Áş^4]ã^ Á@ Á, ^|Á^{ æāj Á, `d^;ç&A^Áçæ)åA , āļ/Ás[ Ás@ā/Ásēj } `æeļ^Á[ }\*Áæc Á(] }\* Áse Á@ Áslãt \*^!/Ási ÁsA³ \* Ár¢&^^å^åDĚÁ
- CĐĂ OE{ ^ Ă, ၛĂ, 'A] ﷺ à š `À à{ هَجْهُ à ) المَعْمَةُ à{ هَجْهُمْ اللَّهُ الْمَعْمَةُ } à ( المَعْمَةُ ) أَ عَبْ اللَّهُ مَعْمَ كَلَمْ وَعَمْ مُعَامًا عَلَى اللَّهِ اللَّهُ عَمْ اللَّهُ عَمْ اللَّهُ عَمْ اللَّهُ فَعَمْ عَبْ الرَّعَمَةُ } أَنْهُ لَكُمْ مَعْمَ اللَّهُ عَمْ اللَّهُ عَمْ اللَّهُ عَمْ اللَّهُ عَمْ اللَّهُ عَمْ اللَّهُ فَعَمْ اللَّهُ عَمْ اللَّ

  $\left[ \left| A \otimes B \otimes A^{*} \right| \left[ \left| A \otimes B \otimes A^{*} \right| A \otimes B \otimes A^{*} A \otimes$ 

Yão@Á^\*ælåÁtĮÁs@Áā•oÁs[}caj\*^}&^Áæskaāt]}Éáeskas[¦åaj\*ÁtjÁs@Á/ÔOEDEÚÁY^||ÁQ;ç^}d[¦^Áes)åÁTÖPÁ^&[¦å•Ás@Á ,^||Áeen/FÏÌHÁÚaj^, [[åAÖ¦ãç^Á;æelÁ^ætA^æl^åÁsjÁGEFIÈAP[Áč¦c@¦Áeskaaāt]}ÁarÁ^ččāl^åÁsjÁ^\*ælåÁtjÁs@árÁ &[}caj\*^}&?Áeskaaāt]}ÉÁ

V@Ą[}|^Á^{ ænijāj\*A&[}cāj\*^}& {Áse&cāj}}AšeA&CA^&[}åEAP[,^c,'E&O@A,^^åA(jAseaåa',^••A@A,v&A,åæ)&^A, [`|åAsh^&slāç^}A,jlājædāj^&s^Ašo@J&AZ,l[`}å,æe^!A^&O]d[!A,lAseAçeaj[!A,^&]d[!E&eajaA,j&A,deo=A,jæe@;æê•A @eeç^Ash^}A^jA[ājāæd\*åAseAsāa\*&\*••^åAsea[ç,CE&AseA]ā@A,v&A^aaj&A,A @eeç^Ash^}A^jA[ājāæd\*åAseAsāa\*&\*••^åAsea[ç,CE&AseA]ā@A,v&A\*a}&A,A []^&Sāā&A^{{ a} apple sec}a^jAseAsāa\*&\*••^åAsea[ç,CE&AseA]ā@A,v&A\*a}&A,A []^&Sāā&A^{{ a} apple sec}a^jAseAsāa\*A\*\* []^&Sāā&A^{{ a} apple sec}a^jAseAsāa\*A\*\* []^&Sāā&A^{{ a} apple sec}a^jAseAsaa\*A\*\* []^&Sāā&A^{{ a} apple sec}a^jAseAsaa\*\* []^&Sāā&A^{{ a} apple sec}a^jAsaa\*\*  []^&Sāā&A^{{ a} apple sec}a^jAsaa\*\* []^&Sāā&A^{{ a} apple sec}a^jAsaa\*\*} []^&Sāā&A^{{ a} apple sec}a^jAsaa\*\*} []^&Sāā&A^{{ a} apple sec}a^jAsaa\*\*} []^&Sāā&A^{{ a} apple sec}a^jAsaa\*\*} []^&Sāā&A^{{ a} apple sec}a^jAsaa\*\*} []^&Sāā&A^{{ a} apple sec}a^jAsaa\*\*} []^&Sāa&A^{{ a} apple sec}a^jAsaa\*\*} []^&Sāa&A^{{ a} apple sec}a^jAsaa\*\*} []^&Sāa&A^{{ a} apple sec}a^jAsaa\*} []^&Sāa&A^{{ a} apple sec}a^jAsaa\*} []^&Sāa&A^{{ a} apple sec}a^jAsaa\*} []^&Saa\*\*\*} []

### 7 Ub¨]hVY`XYhYfa]bYX`k \ Yh\Yf`AB5¨]gʻUb`UXYeiUhY``cb[!hYfa`fYaYXmZcf`G]hY`5`]b``]Yi`cZ [fcibXkUhYf`YIHfUWNjcb`UbX`X]gW/Uf[Y3`fHZAB5¨]g`XYhYfa]bYX`hc`VY`UXYeiUhYžUfYWcaaYbXUhjcb` hc`ZcfaU`mW/Ub[Y`h\Y`fYaYXmig\ci`X`VY`aUXY'ŁÁ

C5;} 迢Á,[}ãq[¦āj\*Áţ-ÁÛãe^ÁOEÁ,^||•Át[¦ÁXUÔ•Á,ā|Á&[}cājč^Á5)á⁄d?¥ÁG€EFJÁse&&[¦åāj\*Ás[Ás@?Á,[}ãq[¦āj\*Á;|æ)Á5)Á C5;]^}åãçÁOEĂ

8 c 'UXX]lijcbU'fYa YX]U'a YUgi fYg'bYYX'hc'VY'UXXfYggYX3''

Þ[È

# 7Á CD9F56 @9'I B+H'& 'G+H9'7'G<5 @@CK'; FCI B8K5H9F'

V@ÁÒçæţi æaāt}ÁÜ^][¦ơka‡•[Á;!^•^} ơ å Ás@Át[}ãtt['ātt]; ätt['ātt]; ätt]; 
CEÁ[{ ^Á,[ā) dấu@ Á^{ ^å^kg[`|å ká^Á[; { æļî Á&@eð) \* ^å ÈV@ai Á&@eð) \* ^Á, [č|å Á, ! ^• `{ æàiî Á^`čā^ Á&ð ÁDÙÖ ÉÁæ Á æá,ājā č { Éá, !Á,[••āà]î Áæ ÁÜ U Ö Áæ { ^} å { ^} džP[, ^ç^!Ê\*āç^} Á @æe Á\*![č] ³ å, æ^!Á&|^æ) č] Á^`ç^|•Á, æî Áa^Á !^æ&@ å Áx@[`\*@[čAÛār ÁÔ,Á ão@aj Áæ Á^, Á ^æ • Éábá, æô Á,[ ó áa^Á, ^& • • æð Át Á\*[Á\*[ Áx@[č\* @áx@ Á, ![ & •• af -{ !{ æļî Á&@eð) \*āj \* Áx@ Á^{ ^å^ ÈÓ çæ čæa j} Ásj Áčč !^ ÁOE Ü Ū • Á,ā] Á [œi ær |î Áa^c \* { āj ^Á,@ cœ ! Áx@ ÁNÙ ÒÚ OE Á T ÚÔ OE Ééee) å ÁDE { î Á:@[` |å Át !{ æ]î Áx@eð; \* Áx@ Á^{ < a^ A, [EÉ,[•• āà]î Éá,@ cœ ! Áx@ Á; æî /á A (]• ^ å ÈÁ

# +'% FYa YXm7 ca dcbYbh [%; fci bXk UhYf UbX Gi fZUWY K UhYf A cb]hcf]b[ '

**8 YgW]dh]cb.**Á‰@ Ár¢āroa) \* ÁÙãc^ÁÔÁr¦[`}å, æc^¦Á([}ãi[¦ā) \*Áj¦[\*¦æ{ Á,ā|Áào^ÁA^çãa ^åÁæe Á,^^å^åÈaÁQDÁ,^,Á •`¦-æ&^Á, æc^¦Á([}ãi[¦ā) \*Á,|æ),Á,ā|Áà^Á;¦^] æ}^å+ÁÇUWGÁÜUÖÁQĘ ^}å{ ^}∞ÅFÁÇƏ∈€ÏDÉA, æt°AÁ+UÉI€DDÉA

#### DYfZcfaUbWY′GHUbXUfX′flck′Xc′mci′\_bck′k\Yb′mciBbY′XcbYL′

Y@}ÁæAj^¦-{¦{ að}&^Á\*¦[`}å, aec^¦Áad)åÁ\*`¦-aa&^Á, aec^¦Á([}ãd(¦ã)\*Áj¦[\*¦ae(Á@ae-Áa^^}A\*•caeà)ã@åÁad)åÁ [}\*[ā)\*Á([}ãd(¦ā)\*ÁaiÁajÁ&[{]|ãad)&^Á, ão@áo@Áj¦[\*¦ae(ÈÁ

#### =g'h\]g'fYaYXmWcadcbYbhVY]b[']ad`YaYbhYX3'

Ÿ^•ĚÁ/æà |^Á ЁFÁ`{ { ælā ^•Ás@ Á, ^¦-{¦{ æ} &^Á; [}ãt[¦ā]\*Á^``ā^{ } } œÊs@ Æt[]|^{ ^} @]\*Á, ældā•Êæb) åÁs@ Á å[&`{ ^} orÁs@een Æt[}cæb;Ás@ Á; [}ãt[¦ā]\*Á, |æ)•ĚØŸÁGEFJÁ; [}ãt[¦ā]\*Á, ærÁ&[}å`&c^åÆb;Ásæs&[¦åæ) &^Á;ãc@As@ Á T [}ãt[¦ā]\*ÁÚ|æ)•Æb;&|`å^åÆb;Ác0Ej]^}åã¢ÁOEÈV@ Á, æz^¦Á`æbáčÁ; [}ãt[¦ā]\*Á[&æætā]}•Æb;åÅb;Ásæs&[¦åæ) &^Ás¢+Ásd^Ás¢+[Á •`{ { æbā ^åÆj}}Ác0et`¦^Ä ЁÉÆb;ååÆb;Ásb;Ásb;Ac0etÈV@ Á; æsħ¦Á`æbáčÁ;[]~åť;[]ät[¦ā]\*Á[

#### K YfY'h Y'a cb]hcf]b[ 'fYei ]fYa Ybhg'Zcf'h ]g'fYa YXma Yh8''

Õ¦[`}å, æe^\kÁ;æ{]|^•Á, ^¦^Á&[||^&c^åÁæeA,^\ká@AØŸÁO€FJÁ{[}ãt[¦ā]\*Á,|æ);Á§AOĘ]^}åã;ÁOÈA

#### =g`UbmgUad`]b[`dfcdcgYX`df]cf`hc`h\Y`bYIhfYdcfh3`

Ÿ^•ÈŐ¦[`}å, æe^¦Áæ)åÁ`¦~æ&^Á, æe^¦Á([}ãt[¦ā)\*ÁæAÛãe^ÁÔÁ,ā|Áa^Á5)Áæ&&[¦åæ)&^Á,ão@Áv@A([}ãt[¦ā)\*Á,|æ)•Á •@\_,}Á5)ÁOE]^}àãrÁOEF\_Æ}åÅAEEEÉA^•]^&æa\*\^ÈÁ

#### 5fY`Ubm'W{Ub[Yg`cf`UXX]h]cbU`UWh]cbg`fYei]fYX`Zcf`h`]g`fYaYXmWcadcbYbh8Á

Þ[ÈÁ

# +"& FYa YXm7 ca dcbYbh &; fci bXk UhYf 7 cbhUjba Ybh

**8 YgW]dh]cb.**Á‰l@^^Ár¢dæstaāj}Á, ^∥•ÉkÔYË⊤Ás@[`\*@ĤÔYË⊤ÉÁ,āţ|Á&[}aāj`^Á&[||^&aāj\*Á&[}æae(ājææ^åÁ \*¦[`}å, æe^¦+ÁQUWGÁÜUÖÁOE[^}å{ ^}å{ ^}œĤFÁQG€€ËDÉAjæt\*^ÁHÌDÉA

#### =gʻh\]gʻfYaYXmWcadcbYbhVY]b[`]ad`YaYbhYX3`

Þ[ĔADE Áåār&č••^åÁ,¦^çāįč•|^Êbà^&aĕ•^Ás@ Ásel^æa∱, Á/\æåÁ&[}&^}dæa£a[}•Ás@eæó4x¢&^^åÁs@ A\*¦[č}å, ææ^¦Á &|^æ}č]Á^ç^|Á,[Á[}\*^¦Á^¢c^}å•Á£[Ás@ Á\*¢dæ&cā]}Á, ^||•Êbs@ Á\*¢dæ&cā]}Á^^•c^{{ Air A}[A[]\*^¦A;]^¦ææ3]\*Êbæ}åÁ c@āÁ^{{ ^å^Á&[{ ][}^}ófarÁ[[cAsči!^}d^ÁsA]\*Áa[]|^{{ ^ba^3}}\*Áa[]|^{{ ^ba^3}}

# +" FYa YXm7 ca dcbYbh, '. '8 ]gW Uf [YcZ91 lf UWIYX K UhYf '

**8 YgW]dh]cb.Ák**Qo¢dæ&c^å/t¦[`}å, æe^¦Á,ā|/Áa^Á,¦^d^æe^å/q;}•ãe^Á,Qee•Á,^&^••æ^ˆDÁ;í/, ^^ó/x@.Áæ)ãæe^^Á^, ^¦Á åã&@æe\*^Ájā,ãe+ÁÇUWGÁÜUÖÁQE; ^}å{ ^}ó/AFÁÇG⊖EEïDÉA;æ\*^Á+ÌDÉÁ

#### =gʻh\]gʻfYaYXmWcadcbYbhVY]b[`]ad`YaYbhYX3`

Þ[ĔADE Áåār&`••^åÁ,\^çāį`•|^Êbà^&æč•^Ás@ Ásch^æaá, Á^\æåÁ&[}&^}dæaá]}•Ás@æaá\¢&^^åÁs@ A`+[[`}å, æe^\Á &|^æ}`]Á^ç^|Á,[Á[}\*^\Á`¢c^}å•ÁE[Ás@ Á\*¢dæ&cā]}Á, ^||•Êbs@ Á\*¢dæ&cā]}Á^`•c^{{ Air A}[A[]\*^\A]^\æa3]\*Ébæ}åÁ c@āÁ^{{ ^a^A&[{ ][}^}ofar Á[[óKaː\\^d^As^3]\*Áa[]|^{{ ^ba^3}}\*Áa]]/^{{ ^ba^3}}

# +"(`FYa YXm7ca dcbYbh (.`@UbX`l gY`7cbffc`g`

8 YgW]dh]cb.Á&WÔ•Á, āļÁa^Á•œaàlā @åÁa[Á,:[c\*&oÁ@Á\*![`}å, æe^¦Á¢dæ&aā[}Ê&d^æe(^}dÉae)åÁa[[3āa[¦ā]\*Á •^•c\*{Áaa}åÁa[Á,![@ãaāaÁ@Áå¦ā]]ā\*Á,Á, æe^¦Á`]]|^Á,^||•Á,ãc@ajÁ@A&[}cæ;ā]æe^åÁ,[¦cāa]}Á;Áx@ÁW}ãAFÁ æč ĩã^¦+ÁQUWGÁÜUÖÁQE;^}å{^}cÅFÁQG⊖€ЁIDÉA;æ\*^Á+UDÉA

### DYfZcfaUbWY<sup>\*</sup>GHUbXUfX<sup>\*</sup>flck<sup>\*</sup>Xc<sup>\*</sup>mci<sup>\*</sup>\_bck<sup>\*</sup>k\Yb<sup>\*</sup>mci<del>B</del>Y<sup>\*</sup>XcbYL<sup>\*</sup>

2[¦Áş) ãuãæd+Ás[]|^{ ^} cæcaā[}EÁ\_@}Ás@ÁNÙÒÚCEÁse) åÁT ÚÔCEÁ@eseç^Áj¦[çãå^åÁ&[}•ã·c^}&îÁse]]¦[çæd-Át¦Áse) ÁUWCÁ ŠWÔÜÖÁs[&`{ ^}cEÁse]|^{ ^} cæcaā[}Á;ā]Áse[}cāj`^Á`}cājÁ`&@ásaā[^Ás@Ást¦[`}å, æc^¦Áse[}&^}cæcā]}•Áseb^Á à^|[、Ás@Áse|^æej`]Ár\ç^|•EÁ

### < UgʻUʻ@;7F8`XcWiaYbhiVYYbʻUddfcjYX`hcʻUXXfYggʻ@;7`]ggiYgʻZcfʻCI&z"]bWiX]b[ʻG]hYʻ7ʻ [fcibXkUhYfžUbX`]gʻ]hVY]b[ʻ]ad`YaYbhYX3ʻ

Ÿ^• ĚÁ/@ ÁWÙÒÚCE£æ) å ÁT ÚÔCE£æ] ] ¦[ç^åÁs@ ÁUWGÃŚWÔÜÖÆ) ÁÙ^] c^{ à^¦ÁGEF€Æ) å Á5a/5á /ás^āj \* Æ[] |^{ ^} c\*åÁ à^Ác@ ÁCE{ ^ĚÜ^çã ā[} Á Á[ Ás@ ÁUWGÃŚWÔÜÖÁ] ær Æ]] ¦[ç^åÆ) Ás@ ÁWÙÒÚCE£æ) å ÁT ÚÔCE59 ÁT æ&@AGEFÌ ÈÅUãc Á Ô/5á Á] æd A[ Ás@ ÁF€Ì Ásæ3¦^• Á] æ)}^åÁ[¦Ás!æ)• ^¦Á[ÁÜæ; •^^ ÁÔ[`} c\*Áse Æs^• &¦ãa^åÆ) ÁÜ^çã ā[} Á ĚÁ @ ÁŠWÔ• Á -{¦Át¦[`}å, æc^¦Áse) å/ÆÆ{[ā/&s[ç^¦Á[¦ÂUãc/ÁÔÁ^{ ænj Æ] A] æsc ĚÅ

## K UgʻUbʻUbbi Uʻg]hYʻ]bgdYWHjcbʻZcfʻ@t7gʻWcbXiWhYXʻ]bʻ:Mi&\$%3ʻ

Ÿ^•ÈAU}ÁR`}^ÁFJÉAGEFJÉAs@ÁCE{^ÉATÞCEÜÞŐÉAæ)åÁRXÁ&{}å`&c^åÁs@Áæ)}`æ‡Á\$j•]^&ca‡i}Áţ-ÁUWCÁ\*áz^•ÈÁ/@Á &@&\|ãróks@æzÁ;ærÁ&[{]|^c^åA\$i`¦ā]\*Ás@Á\$j•]^&ca‡i}Á§i&{i`å^åÁæiA5j&{i`å^åÁæiÁcEÁ

## 8]X'h\Y`]bgdYWhjcb`]XYbhjZmUbmiZc``ck!id`UWhjcbg`bYYXYX'hc`aUjbhUjb`h\Y`dfchYWhjjYbYgg`cZh\Y` @I7g3``

Þ[ Ă

# +') ` CjYfU``FYaYXmZcf`G]hY'7 `G\U`ck `; fcibXkUhYf`

#### DYf2cfaUbWY`GHUbXUfX`flck`Xc`mci`\_bck`k\Yb`mciBY`XcbYŁÁ

Y @}Ác@Á&|^æ)`]Á^ç^|•Á§Á/æà|^ÁFÁ[Ác@ÁUWGÁÜUÖÁQE[^}å{ ^}å{ ^}oÁFÁ[QƏEEÏDÁ@æç^Áà^^}Áæææi]^åÁ  $c@[`*@`óAc@Áze'iæ4Áæ]åÁç^{ca&e4Áv¢c'}oÁ[Ác@ÁUãcAÔÁ][{ ^ÈA$ 

### < Ugʻh\Y`G]hY`7ʻg\U``ck`[fcibXkUhYf`fYaYXmVYYb`Wcad`YhYX`f]"Y"ž\UjY`h\Y`WYUbid``YjY`g`]b` HUV`Y`%cZh\Y`CI&`FC8`5 aYbXaYbh`<sub>l</sub>%fB\$\$++2VYYb`UHU]bYX`h\fci[\cihh\Y`UYf]U`UbX`jYfh]WU`` YIhYbhcZh\Y`G]hY`7`d`iaYt3`

Þ[ĚÁ/ææ]^Á ËCA;¦^•^}@rÁ20¥ÁGEFJÁ\*¦[`}å, æz^¦Á`æ¢äĉ Ásæææke)åÁ@et@etá@etá@etá@etá@etá@etá@exA^åko@rÁ/æåÁ &|^æ)`]Á^ç^|ÈÁU`¦~æ&^Á,æz^¦Á`æ¢äĉ Ásææækez^A;¦^•^}c^åA;}Á<mark>/æe|^ÄËHÉv28</mark>`¦^ÄËHÁ;@ç,•Ás@rÁ?ætá¦`}å,æz%¦Á ^|^çææti}Á&[}d[`¦•Ásæe^åA;}Á;^æ`¦^{ ^}@rÁsjÁ`{ { ^¦ÁGEFÌÈv28`¦^Ä ЁHÁ;@ç,•Ás@rÁ?ætáA^•`|@rÁ;¦Á

#### Á ةUÔŒŠÁŸÒŒÜÁG€FJÁŒÞÞWŒŠÁÚÒÜØUÜTŒÞÔÒÁÜÒÚUÜVÁ

\*¦[`}å, æv`¦Áæ)åAr`¦~æ&^Á, æv`¦Á[&ææā]}•ÈÁ2āt`¦^•Ä.ËlÁæ)åÄ.ËlÁ\*@[, Ás@Ar\æåA&[}&^}dæāi}`¦^&A;|[cc\åA;}Á \*^[|[\*ā&Á&¦[••Á^&cā]}•Á{¦ÂÚão^ÁÔÁ[A\$]`•dæe^Ás@Aş^¦ca&æ4A\*¢cv}oA;~Á\$[]æ&orÁç@Á&¦[••Ë^&cā]}A[&ææā]}•Á æ{^Á\$]`•dæe\åA[}Á2āt`¦^Ä.Ë-DEA

Ù`¦~a&^Á, aæ^¦Á; [}ãt[¦ð]\*Á^•`|o•Á, ^¦^Áaa|Áà^|[, Ás@/Á`¦~a&^Á, aæ^¦Á&|^aa)`]Á^ç^|Á3, ÁØŸÁOEFJĚÁ

#### KYfY`Ubmilf][[Yf``YjY`g`YIWYYXYX`UhUbmicZl\Y`Wcblijb[YbWh`cWUhjcbg3Á

Þ[ĔÁ/@ ÁĴã^ÁÔ/&[} cāj\*^}&`Á[&æatāj}•ÁæjåÁtā\*^¦Árç^|•Áæd^Á @[, }ÆjÁ/æå|^ÁËİËÖ^]^}åāj\*Á;}Á@ Á [[&æatāj}Êfx@ Átā\*^¦Árç^|ÆjÁão@ !Á``æþÁt[Ác@ Á\*![`}å,æe\*!Á&|^æj`]Árç^|Á,!ÁæÁ`¦ææ&^Á,æe\*!Á&|^æj`]Árç^|ĔÁ Õ![`}å,æe\*!ÁæjåÁ`¦æækÁ,æe\*!Á^•`|o\*ÁÇ/æå|^ÂËGÁæjåÁ⁄æà|^ÂËGÁæjåÁ⁄æà|^ÂËDÁ@[,Ác@æaÁtā\*\*^¦Árç^|•Á,^!^Á,[ cÁ ^¢&^^å^å/åjÁo@Á[]c]EÁQÁæÁtā\*^!Árç^|Á,^!^Ár¢&^^å^åÊÉA@

### 7 Ub¨]hVY`XYhYfa]bYX`k\Yh\Yf`U`ZcfaU`W(Ub[Y`hc`h\Y`fYaYXmig\ci`X`VY`aUXY`fhc`Y`]a]bUhY`h\Y [fcibXkUhYf`YlhfUWf]cb`UbX`X]gW(Uf[Y`WcadcbYbhgLcfždcgg]V`mžk\Yh\Yf`h\Y`G]hY`g\ci`X`fighVY` WicgYX3`

Þ[ĚÁV, [Á, ^||•Árcā||Ár¢&^^å^åÁc@/Á&|^æ)`]Árç^|ĔKOEååãcā;}æ4Á, [}ãd[¦ā)\*Ár@[`|åÁa^Á&[}å`&c^åÁa^-{[¦^Ác@ērÁ å^c^\{ājæcā;}ÁarÁ;æå^ÈĂ

#### 8 c UXX]li]cbU fYa YX]U a YUgi fYg bYYX hc VY UXXfYggYX3

Þ[ÈÙãr\ÁÔÁ, ^||•Á@æç,^Á@æåÁ\cæà|^ÁÔUÔÁ&[}&^}dæaā]}•ÁæjåÁs@A`¢ãrcāj\*Á'¦[`}å, æer\A,|`{ ^Á&[^•A,[cÁ æ]]^æ}Á{[Á&^Á(;ā'¦æa3]\*ĚÔ[}c3]`^åÁ([}ã[¦3]\*Á(,Ás@Á`ãrA,ʿā|Á&^A,^¦-{¦{ ^åÁ{[Árçæ]`æerA,`@}Á&[[•`¦^Á{[¦Á Ùãr^ÁÔÁā:Áæ]]¦[]¦ãæerÈ

# 8Á CD9F56 @9'I B=H'&.'G=H9'=G<5@@CK'; FCI B8K5H9F'

XUÔ•Á@æç^Áà^^}Áãa^}cāa³åÁðjÁW}ãoÆÁÇJ^¦&@åÁsĕčã^¦DÁseeÁÙã∾ÁDĚV@Á\*^|^&&ååÁ^{ ^å^ÁðjÁ@ÁFJJÏÁUWGÁ ÜÜÖÁ&[}•ã:d°åÁj-Á{[č¦Á&[{][}^}o\*MáÕ¦[č}å,;æe^¦Á;[}ãt[¦ð]\*ÉŘÕ¦[č}å,;æe^\¦Á\*¢d;æ&coti}}ÉÁÚUVYÁsã&&@æd\*^ÉÁ æ)åÁDãåããti}}ædÁ&@ebæ&cv¦ãæeti}ÈÁ

V@ Áseå åãāj } æļÁsj ç^•cāt æsaj } Ásej å ÁÚ¦^å^•āt } ÁQ; ç^•cāt æsaj } ÁY [ ¦\ÁÚ|æ) Á ^¦^Á&[ { ] |^c^å/sj ÁOŸ ÁGEEETÁÓæe ^åÁ [}Á@•^/Ás[ & { ^}o Éds@ Áj | [] [•^åÁ^{ ^å^ A æ Át Á&] } eā cá -Ásekši æļÁ, @æe ^Áçæszi ` { Ár¢dæstaij } Á ^•c^{ ÊA , @8k@A&[ { àðj ^å Át | [ ` } å, æc'\Ár¢dæstaij } Á ão@Á [ðjÁçæ] [ ¦Ár¢dæstaij } Édat Ás^Ásj •cæ|^å/ásh^} ^æc@ÓČ őjåðj \* Á €GEAOTÁ å'æļÁ, @æe ^Ár¢dæstaij } Ájāj cók\*•cóki ` à•^` ` ^} d^ Áshcel { ðj ^åá/sæshcel Ac & &@ [ |[ \* ^ Á æ Ás] cók^æe õiaj \* Á €GEAOTÁ å'æļÁ, @æe ^Ár¢dæstaij } Ájāj cók\*•cóki ` à•^` ` ^} d^ Áshcel { ðj ^åá/sæshcel Ac & &@ [ |[ \* ^ Á æ Ás] cók^æe õiaj \* Áste Ac & [] , ÁN} ãoÆA, ^!{ ^ æsiðjátî ÉV@ ÁJ WGÁÜU ÖÁOE[ ~} å { ^} cók@esiðsæc \ãi æsaj } Ásej å ÁSWÔ• ÉV@•^Ás@^^ At @æl[ , Á \* ![ ` } å, æc \Át [ ` } å, æc \At [ ] õi[ ¦ðj \* Ésæå åõiāj } æl⁄&@esiðsæc \ãi æsaj } Ásej å ÁSWÔ• ÉV@•^Ás@^^ At æt \Ár{ ^ å ´ A &[ { ] [ } ^} o Áse Árçæti æc å Ásj Ás@ Át ||[ , ðj \* Ár & Caj } e ÉA

# , '% FYa YXm7 ca dcbYbh [%; fci bXk UhYf A cb]hcf]b[ `

8 YgW]dh]cb. 'ÍÕ¦[`}å, æe^¦Á,[}ãį[¦ā), \*Áξ[Ád;æ&\Á^{ ^å^Á,^¦-[¦{ æ}), &^ÈAQ;FJJÏ ÁUWGÁÜUÖÊA, æt ^Á+DÈÁ

DYfZcfaUbWY`GHUbXUfX`flck`Xc`mci`\_bck`k\Yb`mcifiY`XcbYŁ`

Y @}Áæá{, [}ãt[¦ā]\*Áj|æ)Á@æeÁa^^}Á^•œæi]ãr@åÁæ)åÁ;}\*[ā]\*Á, [}ãt[¦ā]\*ÁārÁ5jÁ&[{]|ãæ)&^Á;ãc@k@Aj|æ)ÈÁ

#### =g'h\Y'fYa YXmWca dcbYbhVY]b[ ']a d`Ya YbhYX3Á

Ÿ^•ĚÁ/æà|^Â,ЁFÁ`{{ ælã^•Áœ(Áj,^¦-{¦{ æ)}&^Á; [}ãt[¦āj\*Á/``ā^{ ^}œÉxœ/Ást]|^{ ^}œ3j\*Á;ælæ3•Éæa)åÁ å[&`{ ^}œÁst]}œaājāj\*Á;[}ãt[¦āj\*Á;|æ)•ÈÁOE]^}åã¢ÁOEA`{{ ælã ^•Ác@ÁØŸÁG€EFJÁ;[}ãt[¦āj\*Á;|æ)Áæ)åÁæ)^Á å^çãaæa‡i}•Áæ^Áv¢]|æaj^åÁsjÁOE]^}åã¢ÁÔÈDĚÁ

CE Á; !^çā[`•|^ Áaā] ![ç^å Áa Áa@ ÁNÙÒÚCEáa) å ÁT ÚÔCEÉaa| Áüã AÁãçÕ ãa ã \* Á €CDÁN} ão ÁTÁ, [}ãā[ !ã \* Á, ^||• Á, ^!^Á æàæ) å[}^å Áşi ÁØŸ ÁGEFI Á; !ã ! Át Á@ Áa^{ []ãā] } Á, -ÁÖ ãa ã] \* Á €CEÁU} |^ Á, ^||ÆFWÎ Î Ï Ási Á &@ å` |^å Át Ási Á !^] jæ& å ÉÅ, @BR@ÁS[` |å Ási^Ási^a e^ å Ási^[] å ÁøŸ ÁGEGEÁs` ^ Át Áx@ Á ¢c?} of, -Á, ^} å ã] \* Á^ É\*Iæsiã] \* Áse • [&ãæe à Á ] jæ& å ÉÅ, @BR@ÁS[` |å Ási^Ási^a e^ å Ási^[] å ÁøŸ ÁGEGEÁs` ^ Át Áx@ Á ¢c?} of, -Á, ^} å ä] \* Á^ É\*Iæsiã] \* Áse • [&ãæe à Á ] jæ& å ÉÅ, @BR@ÁS[` |å Ási^Ási^a e^ å Ási^[] å ÁøŸ ÁGEGEÁs` ^ Át Áx@ Á ( of, ^] jæ& à Áşi ÁoŸ ÁGEFJÉÅ, [ Å '![` } å , æe^ !A ] jā \* Á, æ ÁS[ } å` &c å Ås` !ā \* ÁØŸ ÁGEFJÉÅU} & A Árã • œa| ^ å Ét [] ãt !ã \* Á, ^||ÆFWÎ Î Ï Á äl/Ási^Áæt ] |^å Á eæt ] |ã \* Á, æ ÆS[ } å` &c å Ås` !ā \* ÁØŸ ÁGEFJÉÅU} & A Árã • œa| ^ åÉt [] ãt !ã \* Á, ^||ÆFWÎ Î Ï Á äl/ási^Áæt ] |^å Á æt ] /å Áæs&S[ ! å æ} & A Å ãx@á@ ÁØŸ ÁGEFJÉÁU} & A Árã • œa| ^ åÉt [] ãt !ã \* Á, ^||ÆFWÎ Î Ï Á äl/ási^Áæt ] |^å Á æt ] /å \* Ásæs&S[ ! å æ} & A Å ãx@áx@ ÁØŸ ÁGEFJÁÉØŸ ÁGEGHÁT [] ãt !ã \* ÁÚ|æ) ÁÇE‡] ^} åã¢ÆTÉ DÉØã ` !^ ÉFÁ, !^• ^} œ Á æt ãr Á, ]æ} Á[ !ÅÚærÁDÉas &!` å ã \* Áx@ Á[ !{ ^!A[ &æsã] } • Á -Áx@ Á[ , Ásæàæ) å[] ^ åA( [] ãt !ā \* Á, ^||• Áse} å Ásæs&[ !• Ë • ^&cā] } Á[ &ææaī] Á] /• • ^} c å Át } Å

#### =gʻUbmi[fcibXkUhYf`gUad`]b[ʻdfcdcgYX`df]cf`hc`h\Y`bYIhfYdcfh8ÁA

Ÿ^•Ē£adpc@Į`\*@%anofas A&[}cāj\*^}oA;}A&[{]|^caī[}A[.-A\*¦æasåj\*Áse&cañjānā\*•ÁsjÁs@as Áse/æaskajåA^````A}oA^āj•cæd|æanā[}Á [-A[[]ān[¦āj\*Á, ^||ÁEFWÎÎÏËŽÕ¦[`}å\_ æe∿¦A[[]ān[¦āj\*ÁseaAÛāe^ÁQá,ā|Asa^AsjÁse&&[¦åæ}&^Á,āc@As@^A[[}ān[¦āj\*Á ]|æ)A[¦[çāā^åA\$sjÁ<mark>C0]]</mark>]^}åãeÁODEFEÁ

#### 5 fY'UbmWU Ub[Yg'cf'UXX]h]cbU''UW]cbg'fYei ]fYX'Zcf'h ]g'fYa YXmWcadcbYbh3'

Ÿ^• ĚAT [}ãt[¦ð]\* Á, ^||ÁEF WÎÎÏÏÁ, `• cÁà^Á^ð]• cæl|^å Ásec^\!Á\*¦æåð]\* Áse8cã;ãæ?• Á@æç^Áà^^} Á&[{]|^c^åÈÁ

# , "& FYa YXm7 ca dcbYbh, & 5 XX]h]cbU`=bj Ygh][ Uh]cb`

8 YgW]dh]cb. "Quāaǎādā;}æ¢&@eelæ&c^¦ãædā;}Á(-Ác@ÁW;ãc/FÁce)åÁW;ãc/GÁ[ā/Áce)åÁ\*;[č}å,æe^¦ÈA(ÇFJJÏÁUWGÁÜUÖÉÁ ]æt^ÁHDEÁ

### DYfZcfaUbWY<sup>\*</sup>GHUbXUfX<sup>\*</sup>flck<sup>\*</sup>Xc<sup>\*</sup>mci<sup>\*</sup>\_bck<sup>\*</sup>k\Yb<sup>\*</sup>mciffY<sup>\*</sup>XcbYL<sup>\*</sup>

Y@}Áx@^Á,[¦\Á@æe/Áa^^}Á&[{]|^c^à/Áxe&&[¦å∄]\*Á{[Áze]/Áze\*^}&`Áze\*]|{[ç^åÁ;[¦\Á;|aa)-ĔÁ

### <Ugʻl\YfYa YXmWca dcbYbhVYYbʻ]a d`Ya YbhYX3ʻ

Ÿ^• ÈKOEååãoāį}æķÁnjç^• cētæsāį}Á^• č|o-Á,^¦^Ánj&|č å^åÁnjÁOE,]^}åã¢ÁOEA, Ás@ÁÚ¦^å^• êt}ÁQ,ç^• cētæsāį}ÁY [¦\Á Ú|æ)ÁQRæ)čæ^ÁFJJJDÁ,@B&@Á^•č|c^åÁnjÁseA,ä[oÁcčå^ÁnjÁrçæjčær/Åsičæt/Åsčæt/åsčætvásčšč{ Arkdæsdaā]}Ár&@@[|[\*^Á æ]]|æ3ææàājāčĖŹV@Á^•č|cæ)oÁÚ¦^å^• êt}ÁQ,ç^• cētæsāj}ÁÜ/^][¦óÁQTæ&&@ÁGEEFDÁ&[}&|č å^åÅs@æeA,^ão@;¦Ás迢á ]@æ•^Ár¢dæsdāj}Á,[¦Ár¦[č}å,æe^¦Ár¢dæsdāj}ÁsejåÁÚU/YÁsãr&&ees\*^Á&[{][}^}oÁ, cétæAú ir{{]ç^åÁc@Aŕ\[č}å,æe^¦Ár¢dæsdāj}ÁsejåÁÚU/YÁsãr&&ees\*^Á&[{][}^}oA, cétá

## 5 fY`UbmWYUb[Yg`cf`UXX]hjcbU`UWhjcbg`fYei]fYX`Zcf`h`]g`fYaYXmWcadcbYbh8``

Þ[È

# , " FYa YXm7 ca dcbYbh ['. @JbX'l gY'7 cbffc`g`

8 YgW]dH]cb.∵Á/ŠWÔ•Á, āļlÁa^Á•cæaà|ā:@`aÅk[Á];[c^&cAó@A`;[`}å, æe^¦Á¢dæa&cāį}Éksi^æa{ ^}dÉke)àÁ;[}āt[¦ā]\*Á •^•c^{ Áxe}àÁt[Á];[@ñaāoÁc@Á&i¦ā]]3;\*Á;-Á; æe^\A`]]|^Á, ^||•Á;āc@3)Ác@Á&[}cæ4;ājæe^àÁ;[¦cāį}Á;-Ác@ÁW}āoÆÁ æčੱā^¦ÈxÁçUWCÁÜUÖÁQE;^}å{ ^}oÁ?FÁçG€€ЁDÉA;æ\*^Á+UDÈÁ

## DYfZcfaUbWY<sup>\*</sup>GHUbXUfX<sup>\*</sup>flck<sup>\*</sup>Xc<sup>\*</sup>mci<sup>\*</sup>\_bck<sup>\*</sup>k\Yb<sup>\*</sup>mciffY<sup>\*</sup>XcbYL<sup>\*</sup>

Q;]|^{ ^} cæaāj;}A[,~Ás@~ÁŠWÔ•Á,ā|,Á&[;cāj`^Á;cā),Á&@~Át;[`}å,æe^¦Á&[;&^}caæāj;}•Áæb^Áa^/[, Ás@~Á&|^æ);]Á |^ç^|•ÈĂ

### < UgʻUʻ@;7F8`XcWiaYbhiVYYbʻUddfcjYX`hcʻUXXfYggʻ@;7`]ggiYgʻZcfʻCl&zjbWiX]b[`G]hYʻ= [fcibXkUhYfžUbX`]gʻ]hVY]b[`]ad`YaYbhYX3Á

Ÿ^•ÈÁ/@ ÁNÙÒÚŒ£ee) å ÁT ÚÔŒ£, ¦[çãa^å Á&[}•ã c} & â kej] ![çædÁ[ ¦ Á@ ÁU WGÁŠWÔÜÖÁ9, Á\/-] c{ à^¦ÁQEF€É£ee) å Á c@ ÁŠWÔÜÖÁ£er Á§^] \* Át[] |^{ ^} c' å ka ^ Ás@ ÁŒ{ ^ ÈÁU` à•^``^} cA^çã a] • Át[ Ás@ ÁŠWÔÜÖÁ@æç^ Á, [ck&@æ) \* ^ å Á c@ Á\*¦[`} å, æc^¦ÁŠWÔ• Át[ ¦ÂUãc ÁŒÉAZ ( ||[, ] \* Ásaå ããā] ≥ dÁ [ ∄Á9 ç^• cã æcā] } Áse] å Á<{ ^ å ãæcā] } Á&[ { ] |^c å Ås ^ Á C@ Á\*![`} c Á9 ÁOEFI Áse] å ÁOEFI É&@ Á ãc / Ér Á] ; Á\* ãæcà|^Á[ ¦Á7 } c^• cã æcā] } Áse] å Á<{ ^ å ãæcā] } Á&[ { ] |^c å Ås ^ Á Üæt •^^ ÁÔ[`} c Á9 ÁOEFI Áse] å ÁOEFI É&@ Á ãc / Ér Á]; Á\* ãæcà|^Át[ ¦Á7 } c^• cã æcā] } áA { \* å ãæcā] } Á\$E[ { ] |^c å Ås ^ Á Üæt •^^ ÁÔ[`} c Á9 ÁOEFI Áse] å AOEFI É&@ Á ãc / Ér Á]; Á\* ãæcà|^Át[ ¦Á7 } c^• c3 & cå A \* A fa } ] ä ãc à A c] [•` |^ A se] à Á •[ ∄ÁŠWÔ• ÁseAÛãc ÁŒse^A [ Á[] } \* ^ | Å ~ & ~ \* æc ÈZ @ ÁNÙÒÚŒse] à ÁT ÚÔŒ£I, ![çãa^à & A { \* a ãc c}] } č Ás c@ ÁU MGÁŠMÔÜÖÄÜ^çã a] Å ÆJ ÁT æ&@ÆOEFI ɧ, @&@A{ { \* a ac c}} Å A { [ ç^• ÁJãc Áde[ ] å/ŠMÔ• ÈĂ

## KUgʻUbʻUbbiUʻg]hYʻ]bgdYWjcbʻZcf``UbXʻigYʻWcblfc`gʻWcbXiWhYX']bʻ:M'&\$%3Á

U}ÁRX'}^ÁFJÉÃGEFJÉÁs@ÁCE{ ^ÉATÞCEÜÞŐÉ£ee)åÁRXÁ&[}å`&c^åÁs@Áæ)}`æ4ÁUWGA4`ãc^Á§j•]^&cā[}Ě4/@Á &[{]|^c^åÁ&@&\|ã:cÁs[Ás]&|ĭå^åÁse ÁCE[]^}åã;Á2ÉÁ

## 8]X'h\Y`]bgdYWhjcb`]XYbhjZmUbmiZc``ck`id`UWhjcbg`bYYXYX'hc`aUjbhUjb`h\Y`dfchYWhjjYbYgg`cZh\Y` @17g3ÁÁ

Þ[ 🛱

# , "(` CjYfU``FYaYXmŻcf`G]hY`≓G\U`ck`; fcibXkUhYf`

#### DYfZcfaUbWY`GHUbXUfX`flck`Xc`mci`\_bck`k\Yb`mciffY`XcbYŁÁ

### < Ugʻih, Y`G]hY`=ig\U``ck [[fcibXkUhYf`fYaYXmVYYb`Wcad`YhYX`f]"Y"ž\UjY`h\Y`WYUbid``YjY`g`]b` HUV`Y`%cZh\Y`%-+`CI&FC8`VYYb`UHU]bYX`h\fci[\cihi\Y`UYf]U`UbX`jYfh]WU`YIhYbhcZh\Y`G]hY`=i d`iaYb3`

$$\begin{split} & \left[ \dot{E}\tilde{O}\right]\left[ \right] \hat{A}_{a} & \left[ $

#### 8 c UXX]ljcbU fYa YX]U a YUgi fYg bYYX ic VY UXXfYggYX3 Á

Ÿ^•EĂQE Á^˘`^•c^a kā ʿÁU¦àãæa‡ÁQE/SÁ§JÁv@ đÁ/∿cơ\¦Ásæe^åÁQE \*`•oÆGEÃQEEFHÁag) å Áagi] ¦[ç^å/si ʿÁv@ Á/\ÙÒÚQEáag) å Á TÚÔQEÁ;}ÁQE \*`•oÆIEÃQEEFHÉade‡ÁW}JãvÆA([}ãt[¦ĝ]\*Á, ^||•Á, ^!^Ásæag) å[}^å/si ÁQEFIĚAQ,Ásæ&&[¦åæg) &^Ájãv@Áv@A U¦àãæa‡ÁQE/SÁ^˘`^•oÆag) åÁ^\*`|æat[¦ˆÁagi] ¦[çæ¢EÁt[]}ãt[¦ĝ]\*Á, ^||ÆEFWÎÎÏÄ, ä]Åsi^Á^3,ªoæa‡|^åÅsæáv@A æti ^Á |[&ææā];Áseg) å/&i^]c@Át[||[, ĝ]\*Á&[{]|^cā];Át -Á^å^ç^|[]{ ^}dt^|æe^å/tilæeåĝ]\*Át[Át &&čilÁsæAt[i] & ~iÅtoči #åĝ P[, ^ç^¦É&s`^Át[Ác@At ã];ãæ3&ag) cAv¢c'}cAt[+æåĝ]\*Át[Át &&čiEAt[;At &&čilÁsæá];Át -ÆEFWÎÎÏÂt &<br/>

# 9Á CD9F56@9'IB+H'& 'G+H9'?'G<5@@CK'; FCIB8K5H9F'

XUÔÁξ[]æ&orÁ@æçrÁ&^^}Ás&^}á&a^}cãæ?åÁşiÁN}ão/FÁÇI^¦&@°åÁæčੱã^¦DÁeecÁ{[¦{ ^¦ÁÓči‡å∄]\*ÁF€HEĂ/@^Á‡iãerÁ;Ás@A XUÔÁ;[`{ ^ÁşiÁ:@^Á;^¦&@°å/\*'![`}å,æer\'Á@æçrÁ&^^}Á&^~aj^åÁqiÁa^Aà^}aæ@áea)åÁqi{ { ^åãæer\îÁ;[¦c@;^•o4;-Á -{¦{ ^¦ÁÓ`‡åå∄\*ÁF€HEĂ

V@Á^{ ^å^Á^|^&cvåÁajÁc@ÁFJJÏÁUWGÁÜUÖÁ&[}•ãrcvåÁįÁ^ćç^}Á&[{][}^}orÁc@eenáaj&['][¦æevåÁc@Á ^¢ãrcāj\*Á'¦[`}å, æev\Áv¢dæ&cāj}Át'^}&@áejåÁedāj]^¦ÉÄ,@&&@áa^\*æjÁ[]^¦æeāj}ÁajÁCE\*`•oÆJÌÎÈÄ/@Á ¦^{ ^å^Áeq+•[Áaj&]čå^åÁæååãaāj}ædÁajç^•cãtæeāj}ÁįÁc@éA`}•æe覿evåÁ{[ā†+Áa^}^æe@áx@Aačăjåāj\*Á;|æàÈÄUWGÁ ÒÙÖÁÄFÁæåå^åÁŠWÔ•ÁæeÁæÁ^{ ^å^Á&[{][}^}@áajÁGEEJÈÄ

# - "% FYa YXm7 ca dcbYbh, %; fci bXk UhYf A cb]hcf]b[ `

8 YgW]dh]cb. '% [``}å, æe^¦Á, [}ãt[¦ā] \* Át[Át;æ&\Á^{ ^å^Á,^¦-{ |{ æ} &^ ÈH¢; JJÏ ÁUWGÁÜUÖÉA, æt ^ÁHDÈÁ

DYfZcfaUbWV~GHUbXUfX~flck~Xc~mci'\_bck~k\Yb~mci+DY`XcbYL`

Y @ }Áæá, [}ãt[¦ā]\* Á, |æ) Áā Á• cæà |ã @ å Éáe) å Á, [}ãt[¦ā]\* Áā Áā, Á& [} ãæ) & ^ Á, ão@k@ Á, |æ) ÈÁ

#### =g'i\ Y'fYa YXmWca dcbYbh'VY]b[ ']a d`Ya YbhYX3'

Ÿ^•ÈÁ/æà|^Á\İÈFÁ`{{æiã^•Á@A∱^¦-{¦{æ}ækA([}ãt[¦ā]\*Á^``ā^{ ^}œÉk@Ati]|^{ ^}œā\*A∱æka?•Éeee)åÁ@A {[}ãt[¦ā]\*Á¦|æ}Ati[&`{ ^}oÈÁOE]^}åãkÁOEA`{{ æiã ^•Á@ÁØŸÁOEFJÁ[[}ãt[¦ā]\*Á;|æ}Áee)åAee}^Ás^çãeeati}•Áee^Á ^¢]|æai}^åAbjÁOEJ]^}åãkÁÔÈEEÁ

Y æc^\{Á^,c^\|•Áæ^^Á&[ ||^&c^åÁæ}}``æ||^Á\[{ Á\[}ãt[\] āt[\] āt[\] āt[\] āt[\] ā \* Á, ^||•Áæ] å Áa`} å \|^Á, ā^\:[{ ^c^\}•Á\$, Á@^ Á \*\[``} å, æc^\{Á&[ ||^&ca];} Áæ) å Á\;^æt[ ^} c^{A} • c^{EQ} ÁØŸÁ©EFI ÉErI ÁW} ã AFA [] ãt[\] āt[\] ā \* Á, ^||•Á, ^\:^A, ^\{ æ} ^} d^ Á æa æ) å [] ^ å ÉEæe Áæ] ] \[[c^åAsî ^ Ác@ ÁWÙÒÚŒ & a ÁT ÚÔŒ A; } ÁCE \* \* • cÆTI ÉEOEFH & a ÁT æ ÉEOEFI ÈAQ ÁØŸÁ©EFI ÉA [] ^ ÁW} ã AFA [] ãt[\] ā \* Á, ^||ÁGEFWEI Ï DÁ, æ A^\{ æ} A^\{ æ} A] ^ { & a AS} à [] ^ å Áæe Áæ] ] \[[c^åAsî ^ ác@ ÁWÙÒÚŒ & a ÁT ÚÔŒ A [] ^ ÁW} ã AFA [] ãt[\] ā \* Á, ^ ||ÁGEFWEI Ï DÁ, æ A^\{ æ} A^\{ æ} A] ^ { & a a æ} æ] å [] ^ å Áæe Áæ] ] \[[c^åAsî ^ ác@ ÁWÙÒÚŒ & a ÁT ÚÔŒ A [] ^ ÁW} ã AFA [] ãt[\] ā \* Á, ^ ||ÁGEFWEI Ï DÁ, æ A^\{ æ} A^\{ æ} A] ^ A & a á A & ca A & c

### =g`Ubmi[fcibXkUhYf`gUad`]b[`dfcdcgYX`df]cf`hc`h\Y`bYIhfYdcfh8Á

Ÿ^•ÈĂÕ¦[`}å, æz^¦Á([}ãd[¦ā)\*ÁeœAÛãz^ÁSÁ,āļÁa>Á54,Á5,Áæ&&[¦åæ)&^Á,ão@Áo@A([}ãd[¦ā)\*Á,|æ)Á(@[,}Á5)Á CE[]^}åäçÁOEEEÁ

#### 5 fY UbmWU Ub[Yg cf UXX]h]cbU UWIjcbg fYei ]fYX Zcf h ]g fYa YXmWca dcbYbh8 Á

Ÿ^• ÈÁY ^||• ÁEFWÎ €Ì ÉÁEFWÎ €J ÉÁsa) å ÁEFWÎ FFÊÂ, @38.@4, ^¦^Ásaà aa) å[}^åÁ§ ÁGEFI Éása¦^Á &@ å`|^åÁq[Áa^Á ¦^āj• cae|^åÁq[} &^Á&[} • d`&cā]} Ása3cā;ããð • Áse•[&ãane\*àÁ, ãc@4xiã\*Á^å^ç^|[]{ ^} cása¦^Á&[{ ]|^c^åÈÁ

# - "& FYa YXm7 ca dcbYbh & GYbh bY K Y`g

8 YgW]dh]cb. '%Q+ czełaczął }Á(-Á^^) cāj^|Á,^||+ ÁcceÁc@Áa[cc[{Á(-ÁV),ão/F Áce) åÁt[]Á(-ÁV),ão/A ÈA(FJJÏÁ JWGÁÜUÖÉA]] zē ^Á-DÉÁ

#### DYfZcfaUbWY`GHUbXUfX`flck`Xc`mci`\_bck`k\Yb`mciBY`XcbYŁÁ

Y @}Áx@Ą^||•Á@aç^Áa^^}Á§,•caa|^åÁa&&&[¦åã]\*Á{[Áa&A^\*`|aa[¦Áad]]'[ç^åĄ`[¦\Ą|aa)ÈĂ

#### =g'h\Y'fYa YXmWca dcbYbh'VY]b[ ']a d`Ya YbhYX3'

Ÿ^• ĚÁ/@·ÁW]]^¦ÁW}ãoÁHÁ^}cāj^|Á, ^||Á, æ•Á§,•cæ|/åÁ§,ÁØ^à¦`æ^ÁØ€€€Áξ,Á、[}ãt[¦Á,[c^}cãæ‡ÁXUÔ•Á;ã\*¦ææāţ}Á c@[`\*@kw@·ÁW}ãoÁÆa]|Áæč`ãæ±åÁ§jq[Ác@·ÁW}ãoÁHÁæč`ã^¦ĚÁ

#### K \ UhiUfY'h Y'fYgi `hg`cZh Y'I b]h%d]Ynca YhYf 'UbX'I b]h' 'gYbh]bY `k Y``gUa d`]b[3'

V@Ajat:[{ ^c^¦+ÁQW}ãa/FA^}cāj^|Á,^||•DÁ,^¦^Árae{]|^å/AjÁT æ3&@ÁO€€€Á,ãc@Á∧•č¦orÁ(@\_jāj\*Á,[ÁÖÞOEÚŠÁ ]¦^•^}&^Áeeká@ÁN}ãa/FEN}ãa/GABjc~¦-æ3AÊBeekáãa&`••^å/AjÁ©A/QČ€€€ÁOEÚÜÈA/@aiÁjæaÁj}^ČEāti^Árae{]|āj\*Á ^ç^}dEBeeká^č ĭā^å/Aia^Áx@ÁT ÚÔOEEN/ÙÒÚCEAet]|{[c^å/Aŭ/k^å^•ãt}ÁQ;c^•cātæati}AY[¦\ÁÚ|æ)ÉAÚā&ÁSÉA/ÔOEOEÚÉA ÔÜOEEBA/à¦ĭæ^ÁFJJJÉBeejå/Ais\_Ai@Ak[&č{ ^}cvå/AsÁsó@ÁÚ¦^å^•ãt}ÁQ;c^•cātæati}ÁÜ^][¦dÉAUã&ÁSÉA/ÔOEOEÚÉAÓÜOEÉA Ö^&^{à^¦ÁG€€FÉAU¦¦Á,@a&@Á∧\*č|æt[¦^ÁSL]&či!\^}&^Á;æA^&aç^åÉA

V@ÁW}ãÁHÁ^}cā,^|Á,^||ÁŞEHWÎGEDÁ, æá Áæ{]|^å Á§jÁT æl&®ÉAT æl&®ÉAT [ É&Be) å ÁÙ^] ơ{ à^!ÁQEEEÁBe) å Á§jÁRæ) \* æl^ÁQEEFÁ -{¦Á©@Á \* ælơ':|^Áæ{]|ā] \* Á^ \* \* ã^å Ásî Ás© ÁÚ!^å^• ã } ÁQ; ç^• cã ææāi}ÁY [ :\ ÁÚ|æ) ÉÀŬ \* à•^ \* ^> d^ É&©Á, ^||Á āj &['][!æe^å Á§j d Ás@Á^\* \* |æÁ/ÔCECEÚÁ; [ }ãd; !ā] \* Á, !æ) ÉV@Á, ^||Á, æ Áæd; ] |^å Á§jÁT > ÁQEEFJÁ j &['][!æe^å Á§j d Ás@Á^\* \* |æÁ/ÔCECEÚÁ; [ }ãd; !ā] \* Á, !æ) ÉV@Á, ^||Á, æ Áæd; ] |^å ŧjÁT > ÁQEEFJÁ j &['][!æe^å Á§j d Ás@Á^\* \* |æÁ/ÔCECEÚÁ; [ }ãd; !ā] \* Á, !æ) ÉV@Á, ^||Á, æ Áæd; ] |^å Á§jÁT > ÁQEEFJÁ j @@Á^• \* |o•Á; !^•^} o\*å ÆjÁ/æ∂[^Á] ÉEÉÆP[ ÁUão ÁSÁÔUÔ•Á, ^!^Áså^ & &o\*å ÆjÁ@AV} ãAHÁ^} cā] ^|Á, ^||ÁœÁ &[ } &^} dæaāi} • Áæai[ ç^Ás@Á; ^c@a å/så ⁄c &cāi } Áãi ãiÉAP[ , ^c^!É&@ ÆHWÎGEFA æti] |^Á^][ ! o\*åÅæÆFÊ Éaãi ¢æ} ^ Á &[ } &^} dæaāi} • Áæi]; Á, ÆÉÁµ\*EŠÁœ Á; !^o\*} o\*åÆjÁZæai]^ÁIË ÉA/@ã Æ Áã ^|î Á^|æe^åÁtā & @Á; Ás@Á; !^o\*} & At WjãAHÁ\*![ \* }å, æe^!Ás@[ \* @; Ós@Á; ^o\*k]; Á[ !cāi} Á; Á/ÔCECEÚÉÆe Á;]] [ • ^åÁtá ÁsæÁ^|^æ^A'{{ Ai E ÉA} WjãAHÁ\*![ \* }å, æe^!Ás@[ \* @; Ós@Á; ^o\*A'; Á; [ :cāi } Á; Á/ÔCECEÚÉÆe Á;] ] [ • ^åÁtá ÁsæÁ\*] \* æ

5 fY`UbmWYUb[Yg`cf`UXX]hjcbU`UWhjcbg`fYei]fYX`Zcf`h`]g`fYaYXmWcadcbYbh8``

Þ[È

# - " FYa YXm7 ca dcbYbh, ' . < mXfUi `]W7 cbHJjba Ybh

**8 YgW]dh]cb.**Á‰M∙^Áį.-Á∿¢āroāj\*Á5jo∿¦&^]d[¦E0^&[ç^¦^Ásl^}&@Ás[Á8[}cæaājÁs@?Á;|`{^Ása)}åÁ^{[ç^Ás[]æ&oråÁ \*¦[`}å, æe^¦ÈaÁÇFJJÏÁUWGÁÜUÖÉAjæe\*^Á+DDÉÁ

#### DYfZcfaUbWY`GHUbXUfX`flck`Xc`mci`\_bck`k\Yb`mciBY`XcbYL`

Y@}Áx@Áx!^}&@#af4]^¦æe3j\*Áxee/&i^•a\*}^åÁxe3jå/&xe3jč'¦3j\*Áxe4jÁ\*¦[`}å, æe^¦Á^¢&^^å3j\*Áx@/&x4^æ3j`]Á^ç^|•ÁxeeÁ ]¦^•^}&^åÁajÁ/æaà|^ÁFAf(-Áx@ÁFJJÏÁUWGÁÜUÖÉxe3jåÁ×'¦@@¦Á&^•&¦ãa^åÁa^|[, ÈÁ

#### =g'h\Y'fYa YXmWca dcbYbh'VY]b[ ']a d`Ya YbhYX3'

Ÿ^•ĚV@Á'¦[`}å, æv\Á&[||^&cā;}Á^•c^{Á&[}cā;`^•Á{[Á,'][çãa^Á&æa]cč¦^Áçæe Áå^•&Jāa^åAæev\Dá, Ás@ÁV}ãóÆÁ \*'[`}å, æv\ÉÄ]\*¦æåā?}óA, Ás@Ád^}&@Ása}^?^æ@Ása^}^æ@Á@Á{['{ ^\ÁO`ã¦åā]\*ÁF€HÁ[[d]¦ā]dÉ&e Áå^•ã}^åĔQÁØŸÁ GEFIÉ&@ÁO`ã¦åā]\*ÁF€HÁ|æàÁ, æe Á^{ [ç^åÁse Ájædó, Ás@ÁãrÁ^åc^\[]{ ^}óÁse&cã;ãa3•ěÅ

#### =gʻh\Y`gmghYaʻdfcj]X]b['\mXfUi`]WWUdhifY`cZh\Y`d`iaY3`

Ÿ^•ÈÁY æe∿¦Á∿ç^|ÁsæææÁsd^Á,¦^••^} e∿å/ÁsjÁ/æaai/Á/Ü≕ÉA261\*;!^Á/ËCAJ,¦^•+^} orÁæá,|æajÁçã?, Át,-Ásoe/Á',[`}å,, æe∿¦Á &[}q[`!•Á¦[{ Ásoe/ÁRT}^ÁOEFJÁ[`}å/At,-Á'¦[`}å, æe∿¦Á∿ç^|Á, ^æe`!^{{ ^}orÉA0EAJ,^•e'c'åÁ, ^||•Éaoe/Á,`{ ^!a&eadj^Á |[, ^•oÁ, æe∿¦Á'|^çææatj}Á, æeÁ •^åÁqt,Ásu'^æe'Ácoe/Á,|æajÁçã?, Á&[}q[`i•ÈAT[}ãnt[i∄\*Á, ^||•Ås[], }\*¦æåã?}óÁg2èÈÉA €FWÎGÏDÁ,-Ásoe/Á¢dæ&catj}Ásl^} &@Atop (As[}•ã e'}d^A2etee)d^A2etee €FWÎGÏDÁ,-Ásoe/Á¢dæ&catj}Ásl^} &@Atop (As[}•ã e'}d^A2etee)d^A2etee €FWÎGÏDÁ,-Ásoe/Á¢dæ&catj}Ásl^} &&@Atop (As[}•ã e'}d^A2etee)d^A2etee €FWÎGÏDÁ,-Ásoe/Á¢dæ&catj}Ásl^} &&@Atop (As[]•ã e'] €FWÎGÏDÁ

X^¦ca&eqÁ&ea];č¦^Á, æe Ásdpe [Á\*~^&caç;^Ásee Ásqi\*•clæe\*åAţ}ÁQ21\*'¦^ÁJEHEXOE Á\*^^}Aţ}Ás@ Á81\*'¦^ÉX\*![`}å, æe\*¦Ás[c@Á `]\*¦æå?a}o%sejåÅs[;}\*¦æå?a}o%tá\*a}o%tá\*A\$&@Ásd\*A\$&eqástč\*¦^åÅsea];č¦^åÅsejåÅ&[||^&c\*åÉV@ Á];æååÅ\*¦æå?a}o%t¢@ãaã\*åAţ}Á c@ Ás[;};æååÅ\*¦æå?a}o%tá#a^Aţ Ás@ Ásd^}&@ÁsGEFVÛGÎDÁsjå3&æe\*•Ás@æef\*'![`}å, æe\*¦Ás[[^•A,[c4ţ a1'æe\*Ásd^|[;Á c@ Ás[^}&@EÁV@ Át[]}aī['];a\*á&[ç^!æ\*^Áj+][çãa^åÁsî^Ás@ Ási`}å|^Áj?a\*:[{ ^c\*\\*Éssa\*{[]}\*dæe\*\*Á&[{]]^c\*Áç^¦c3&eqÁ æ)åÁ@[iã[}ced#@ å]æ'{&eqástč\*A\$

201 \* ¦^ÁlĒIÁJ¦^•^}œÁœÁ/ÔÒÁ&[}&^}dæaāj}•Á'[{ÁœÁOEFJÁag}\*Á;~||•ĒÁv@Á;]|āj\*Á<sup>\*</sup>ç^}dĚAv@Á,|`{^Á, æsÁ [¦ālājæ||^Ás<sup>\*</sup>^aj^åÁsæo^åÁ;}ÁsæææÁ'[{Áad|Á; Ás@Á;[}ãi[¦āj\*Á;^||•ĚÁv@Á;|`{^Á, æsÁs@}Á^aj^åÁsæo^åÁ;}Á c@Á^•`|œÁ; Ás@ÁOEFIÁ\*^[]¦[à^Ásjç^•cālæaāj}ĚÁv@Ásč¦!^}dK,[}ãi[¦āj\*Á;^||Á^c;[¦\ÁstÁ\*-^åÁkjÁs@^åÁ;] c@Á^•`|œÁ; Ás@ÁOEFIÁ\*^[]¦[à^Ásjç^•cālæaāj}ĚÁv@Ásč¦!^}dK,[}ãi[¦āj\*Á;^||Á^c;[¦\ÁstÁ\*-^åÁkjÁs@^åA;] c@ÁA^\*`|œÁ; As@ÁSEFIÁ\*^[]¦[à^Ásjç^•cālæaāj}ĚÁv@Ásč¦!^ a®ÁsE]}d[`\*oAsdjáA; ^æ\*`!^Ás@Á; \*\*\*\* jā@ÁsE]}eãa^|æaāj}Á; Ás@Á\*¢c^}•ãç^Á@á;d[¦a&aqÁsæææÆ]^&ãa&aa|^Ás@ÁOEFIÁsæææÁ;[{Ás@Á\*[]¦[à^Á äjç^•cālæaāj}ĚÅ

#### 5 fY`Ubm'W{ Ub[ Yg`cf`UXX]h]cbU`UWH]cbg`fYei ]fYX`Zcf`h ]g`fYa YXmWca dcbYbh3Á

Þ[ókæn közá ∧ Ékv, [Á, [}ãt[¦ā]\*Á, ^||•Ág€FWÎ €I Áse) å Á€FWÎ ĠI DÁ@á (‡¦ 88æn ∥^Á •^å Át[Á, [}ãt[¦Â@ å ¦ æ' | 88 Áse] č ¦ ^ Á , ^¦^Áseà æ) å [}^å Ásj ÁG€FI Ási^&æĕ •^Át, Árãt^Á^å^ç^|[] { ^} ófwe&cã;ãtã • ĚÅP[, ^ç^¦ ÉÅ ¢ãrcã) \*Á, ^||•Ág€FWÎ €HÉÁ €FWÎ FGÉÆFWÎ FÎ ÉÆFWÎ FÏ ÉÆFWÎ GFÉÆFWÎ GÎ ÉÆFWÎ GÎ Áse) å ÁEFWÎ GÏ DÁ[ &æz\*å Á] Áse) å Ås[, }Á ‡ æsta å? oft, Ás@ Á &[ ||^&cãt] }Ás'} & @áj ¦[çãta^Áseta^``æz\*Á&[ç^¦æt^Át[¦Á @en [[] { \*} a æz\*¦ Á@ å ¦æt | 88 Áse] å Å æz\*¦ Á &[ ||^&cãt] }Ás à &@áj ¦[çãta^Áseta^`` æz\*Á&[ç^¦æt ^Át[¦Á @en [[] { \*![``} å , æz\*¦ Á@ å ¦æt | 88 Áse] å Å æz\*¦ Á &[ ]] ãt[¦ā] \*Áse) å Åç^¦ãt Á@ å ¦æt | 88 Ást[} cæaj { ^} ófwen Û a Ase Âs ÉÖDã å ãtāt] ≥a Át, [] ãt[¦ā] \* Áçaj &|` å ä] \* Ás@ Á, ^^ à Át | Á æta å ãtāt] ≥a Át, [] ãt[¦ā] \*Á, ^||• DÁ, ä] Ås^ Atçæt æz\*à Á ] [] Ást[ { ]] / cãt] }Á, A^A å^cç^|[] { ^} oft, |æ] • Át[ Ás@ Áse ^ætĂ

# - "(` FYa YXm7 ca dcbYbh ( . `; fci bXk UhYf `Hf YUha Ybh

8 YgW]dh]cb.Á‰{^æe{ ^} o{{\, - Æ}{ } a ; æe^ å Æ \[`} å, æe^ \Å • ā \* Ásaā Á dā] ]ā, \* ÈÁÇFJJÏ Á UWGÁÜUÖÊA; æt ^ Á+DÈÁ

DYfZcfaUbWY`GHUbXUfX`flck`Xc`mci`\_bck`k\Yb`mciBY`XcbYL`

Y@}Áx@ ÁxaálÁ dí]]ð] \* Áza&őjáãć Ása Ád^zazð] \* Á zaz^¦Át[Áx@ Á&|^ze)`]Á cze) åzetå•ÈÁ

=gʻh\YʻfYa YXmWcadcbYbhVY]b[`]ad`YaYbhYX3Á

Ÿ^•ÈÄÖ`¦āj\*Á⁄2ŸÁQEFJÉ£v@ Át^æa{ ^}oA^•oc^{ Ač}&caāj^å&epjåÁ; æ•Á[]^¦æaāj}}aéÁJÍÃÁ[,-Áv@ Ávāj ^ÈÄO`¦āj\*Á⁄2ŸÁ GEFJÉ&exÁ^\*č|æ÷Á[æäjc?}æ)&^Á&@ åč|^Á; æ•Á[æäjaæäj^åÈÄOE]]^}åãcÁ?PÈFÁ\*č{{æiã^•A[]^¦æaāj}}aéÁůæææÁepjåÁ ^ç^}orÁseeÁs@Ač¦[č}å, æe^¦Áv¢dæ&caāj}Áæ)åÁt/æa{{^}o^{\*}•c^{EA

5 fY`UbmiW(Ub[Yg`cf`UXX]h]cbU`UWN]cbg`fYei]fYX`Zcf`h]g`fYaYXmWcadcbYbh3`

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# - ') FYa YXm7 ca dcbYbh; ). HfYUhYX K UhYf 8 ]gW Uf[ Y

8 YgW]dh]cb.Á %;@æi\*^Á; ~Át/ææ^åÁt¦[`}å, æe^¦Át; ÁÜ3&^ÁÔ¦^^\ÈÁÇFJJÏÁJWGÁÜUÖÉA; æt^Á+DÈÁ

DYfZcfaUbWY'GHUbXUfX'flck'Xc'mci'\_bck'k\Yb'mciBY'XcbYL'

Y@}Á@A^•c^{{A≣A[]^¦ææa]\*Áæe Aå∧•ã}^åAæ)åÁs@At^æeråÁ,æer\Asãa &@æt\*^•At[Ás@e Aid[¦{Á^, ^¦As@æeA [čd^orAt[ÁÜ38xAÔ¦^^\ÈV¦^æeråÁ,æer\AsāA^ččā^åAt[Á; ^^oks@A`à•œa)æajrAA^ččā^{{A}orAt[}{A``ā^{{A}orAt[EA TÞW€€€JÍÏJÁÇTÚÔOEDEA;@38@As[}œæa]•Ás@A cæerEæs&A]c\*åAsãa &@æt\*^Áa[ãorAt[¦Á`¦-æsArÁ;æer\ÈAUæt[]|a]\*Á æ)åAsa)æf`•ãrÁsa^Áj^¦-{¦{ ^åAt[Á[]}ãt[¦Áj^¦-{¦{ æ}&At@j^^Asar[],DEA

=g'h\Y'fYa YXmWcadcbYbh'VY]b[']ad`YaYbhYX3'

Ÿ^• ÈÙ^^ &ã & •• ā } Á Å Â\^ &cā } Å È ÈĂ

5 fY`UbmWYUb[Yg`cf`UXX]hjcbU`UWhjcbg`fYei]fYX`Zcf`h`]g`fYaYXmWcadcbYbh8``

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# - "\*` FYa YXm7 ca dcbYbh; \*.'8]gW Uf[YAcb]hcf]b[`

8 YgW]dh]cb.Á/3...[}ãt[¦ð]\*Át[Átlæ&k Á&[{]|ãe) &^Á,ã@\$klā &@eet\*^Á^``ð^{ ~ `ð^{ ~ `ðA}FJJÏ ÁUWGÁÜUÖÉA,æt^ÁHDÈ

DYfZcfaUbWY'GHUbXUfX'flck'Xc'mci'\_bck'k\Yb'mciBY'XcbYL'

Y @ } Ázef, [ } ãt [ ¦ā] \* Á, |æ) Ázi Á\*• cæà |ã @ å Áze) å Ázi Åa, ā] \* Ázi ] |^{ ^ } (^ } c^ å Ázi Ázes & [ ¦å æ) & ^ Å, ão @ kœ Á, |æ) ÈA

## =gʻh\YʻfYaYXmWcadcbYbhVY]b[`]ad`YaYbhYX3`

Ÿ^• ĚÁ/!^ æ ({ ^} of (\* • c\* { Á; [} ãt [ ] āt [ ] āt [ ] \* ÁS[ ] • āt c\* å Á; -Á \* æ c\* || ÁB; - [\* ^} of æ] å Á ~--[\* ^} of æ] å Á ~--[\* ^} of æ] å Á ~--[\* ^} of æ] å Á ~--[\* ^} of æ] å Á ~--[\* ^} of æ] å Á ~--[\* ^} of æ] å Á ~--[\* ^} of æ] å Á ~--[\* ^} of æ] å Á ~--[\* ^} of æ] å Á ~--[\* ^} of æ] å Á ~--[\* ^} of æ] å Á ~--[\* ^} of æ] å Á ~--[\* ^] of æ] å Á ~--[\* ^] of æ] å Á ~--[\* ^] of æ] å Á ~--[\* ^] of æ] å Á ~--[\* ^] of æ] å Á ~--[\* ^] of æ] å Á ~--[\* ^] of æ] å Á ~--[\* ^] of æ] å Á ~--[\* ^] of æ] å Á ~--[\* ^] of æ] å Á ~--[\* ^] of æ] a Á ~--[\* ^] of æ] / a á &--[\* -] of æ] a á &--[\* -] a &--[\* -] a &--[\* -] a &--[\* -] a &--[\* -] a &--[\* -] a &--[\* -] a &--[\* -] a &--[\* -] a &--[\* -] a &--[\* -] a &--[\* -] a &--[\* -] a &--[\* -] a &--[\* a &--[\* -] a &--[\* a &--] a &--[\* a &--] a &--[\* a &--] a &

#### Á Ø©ÜÔŒŠÄŸÒŒÜÁG€FJÁŒÞÞ₩ŒŠÁÚÒÜØUÜTŒÞÔÒÁÜÒÚUÜVÁ

¦^][¦c^åÁşiÁc@ÁÖ^&^{ à^¦ÁOEFÌÁæ;]|^ĚÁ/@Áæ•ÓÁ^|ææặ;^|^Á@ăt@Á&[]]^¦Á&[}&^}dæaā;}áşiÁæ;iA\*--,`^}óÁ •æ;]|^Á;&&`¦!^åÁşiÁTæ&@ÁOEFÎÁÇHFÁµ\*EŠDÁæ;åÁæá^•æ;]|^ÁşiÁOEfÌÁ@æáiÁåt}ãt}ã&ææ;d^Á[, ^¦Á&[]]^¦Á &[}c^}ó4ÇEÈÁµ\*EŠDĂÙæ;]|āj\*Áj¦[&^å`¦^•Á;ā|Á^{ æājÁ}}&@æ;j\*^åÁæ;åÁč;č¦^Á?--,`^}ó4^•`|o•Á;ā|Áå^Á ^çæ;čæčåĚÁ

CE Á^][¦c^åÁşiÁ@ÁØŸÁOEFÏÁOEÚÜÉ£şi, 4^˘`^}dÁ¢&^^åæ)&^•ÁţiÁ®Aj@[•]@[¦`•Áæ)åÁ∃j&Ásiār&@ede\*^Á&iāeA [&&`¦l^åÉÉsi`dÁ,[Á&æĕ•^Á;æ Ási^c';{3j^åÈÉUæqi]|3j\*Á;![&^å`¦^•Å,^l^Á[[åãa?åÁqiÁ@[k][`\*@îÁ]`•@ése|A •æqi]|3j\*Áj3]3j\*Ási^-{¦^Á~-{i`^}ofiæqi]|^•Áæ?^Ks[||^&c^åÈÉV@siÁ;![&^å`¦^Á@æe Áse]]æ^}d^Á^å`&^åÁs@A ][c^}cãeqÁs@æeÁjædcã&|^•Áæ&&`{`|ææ3j\*Á;}Ás@∱3]3j\*ÁseA^A;[dás^3]\*Ásæ3¦3ðåÁqiç^¦Á5jqiÁs@[A]aqi]|^•Á&æě•3j\*Ás@A ^¢&^^åæ)&^•ÁqiÁ3j&ÁsejåÁq@[•]@[¦`•ÁāqiãoEÁ

### 5 fY`Ubm'W(Ub[Yg`cf`UXX]h]cbU`UWh]cbg`fYei]fYX`Zcf`h\]g`fYaYXm'WcadcbYbh8``

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# - "+` FYa YXm7 ca dcbYbh, +. 5 XX]h]cbU`=bj Ygh][ Uh]cb`

8 YgW]dh]cb.ÁQGååãāų }æÁ&@eelæ&c^¦ãæeųų }Áį.-Ác@Á}•æč¦æe^åÁW}ãAFÁ[ąÈÁÇFJJÏÁJWGÁÜUÖÉÅ,æ\*^Á+DĚÁ

### DYfZcfaUbWY`GHUbXUfX`flck`Xc`mci`\_bck`k\Yb`mciBY`XcbYŁÁ

Y @ } Ác@ Áscá åãtā[} æ Á5g ç^• cēt æ atā] } Á@ze Ás^^ } Á8[ { ] |^c^å Ásc688[ ¦ å ā] \* Át[ Ásc4\^\* ` |æ at[ ¦ Ásc4] ] ¦[ ç^å Á, [ ¦\ Á, |æ) ÈÁ

### =g'h\Y'fYa YXmWca dcbYbh'VY]b[']a d`Ya YbhYX3'

Ÿ^•ĚA/@ÁY[¦\ÁÚ|æ)Á, æe Áæ]]¦[ç^åÁ5)ÁØŸÁFJJJÈADEÁ^][¦ơÁ, Ás@Á5)ç^•cāt æzaī}}Á^•č|o•Á^&^āç^åÁseÁ &[}•ã·c^}&^Ás^c^!{ājæzaī}}Á![{Á^\*č|æz[!•Á;}ÁÖ^&^{à^a} ^åA©ÆFĚA/@Á^][¦ơ&s^-āj^åÁs@Á\*¢c^}ơÁ; ÁXUÔÁ &[}cæa[ājæz^åÁ\*[↕Ás^}^æz@ÁÓčāåāj\*ÁF€HÁsejåÁ^-āj^åÁs@Á[&æzaī]}Á;Ás@Á^[č+&s^ásé^æžÉA/@Á^][¦ơ&s)åÁ •čà•^č`^}oÁ{[|[, Á]Á\*æa[]]āj\*Á^•[|ç^åÁse][{æa[č•Ásā\*•[|ç^åÁ3j&EÄA^æåÊÅsejåAja&A]AsaaAsaa {[}aze^'šAja&EÅa]&EA/æåÉseejåÁja&A^[c];c^åÁse][{æa[č\*Ašā\*•[|ç^åÁ3j&EÅA]&SEA/æåÊÅsejåAja&A] {[}ãz[¦āj\*Á, ||•ÉAZāj&EÅA^æåÊseejåÁj&AA/æs^A,[Á[]\*^!Ač![č]}å,æs^!K&[}&A'}+EÅ

5fY`Ubm'W(Ub[Yg`cf`UXX]h]cbU`UWh]cbg`fYei]fYX`Zcf`h\]g`fYaYXm'WcadcbYbh8``

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# - ", `FYa YXm7 ca dcbYbh, , .`@UbX'I gY'7 cbffc`g`

8 YgW]dh]cb.Áčá\\Ó•Á,ā|Aka^Á+∘cæaà|ã:@åÁk[Á¦:[c\*&cAk@Á':[`}å,æe^¦Á¢dæ&cā[}Ê&sh^ææ{ ^}cÉ&e}åA([}ãt[¦ā]\*Á •^•c^{ Áea}åÁk[Á]:[@ãaãaÁ@Á&lā]a]\*Á;Á,æe^¦Á`]]|^Á,^||•Á,ãc@3)Á@Á&[}cæ{ ā]æe^åÁ;[¦cā[}Á;Ác@Á\\}ãAFÁ æč ã^¦ÈAQUWCÁÜUÖÁQE;^}å{ ^}cÁFÁQCE€Ë DÉA;æ\*^Á+UDÉA

#### DYfZcfaUbWY`GHUbXUfX`flck`Xc`mci`\_bck`k\Yb`mciBY`XcbYŁÁ

Q;]|^{ ^}; cæcaj;}Aj; -Ác@AŠWÔ•Á; aj|A&[}caj`^Á};cajA`&@Acaj ^Ác@A`¦[`}å;; æc^¦Á&[}&^}dæcaj;}•Ácd^Aba^|[;Ác@A &|^aaj`]Á^ç^|•ĚA

### < UgʻUʻ@;7F8`XcWiaYbh'VYbʻUddfcjYX`hcʻUXXfYggʻ@;7`]ggiYgʻZcfʻCl&z]bWiX]b[ʻG]hY`?` [fcibXkUhYfžUbX`]gʻ]hVY]b[ʻ]ad`YaYbhYX3`

Ÿ^•ÈÁ/@:ÁNÙÒÚOEæ) åÁT ÚÔOEA;¦[çãa^åÁ&[}•ãrc/}&`Áæ]]¦[çæ4Á[¦Ás@:ÁUWCAŠWÔÜÖÁ&JÁÙ^]c^{à^¦ÁO∈F€Áæ) åÁ ãvÁarÁaj\*Á&[]|^{^}{^}c^åÁa`Ás@:ÁOE{^ÈÁU`à•^``^}c4^çãrā[}•Á4[Ás@:ÁŠWÔÜÖÁ@æçr^Á;[cÁæ-^&c^åÁs@:Á \*¦[`}å, æc\*¦ÁŠWÔ•Á4[¦ÁUāc^ÁSEÁ Á ØQJÔQEŠÁŸÒQEJÁGEFJÁGEÞÞWQEŠÁÚÒÜØUÜTQEÞÔÒÁÜÒÚUÜVÁ

#### K UgʻUbʻUbbi Uʻg]hYʻ]bgdYWF]cbʻZcfʻ@:7gʻWcbXi WhYX`]b`: M`&\$%3`

U}ÁR`}^ÁFJÉEGEFJÉEk@ÁQE{^ÉATÞCEÜÞŐÉben)åÁRXÁ&[}å`&c^åÁx@Áen)}`æ¢A5j•]^&cafi}Á(,-ÁUWCA\*áz^•ÈA/@Á &@&\\ãrók@exeçÁ, ærÁ&[{]|^c^åÁs`¦ā]\*Áx@Á5j•]^&cafi}Á5j&{`å^åÁse-ÁQE]]^}åã¢ÁQÈA

#### 8]X'h\Y']bgdYWhjcb']XYbhjZmUbmiZc``ck!id'UWhjcbg'bYYXYX'hc'aUjbhUjb'h\Y'dfchYWhjjYbYgg'cZh\Y' @17g3Á

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## - "- ` Cj YfU``F Ya YXmZcf`G]hY`? `

DYfZcfaUbWY'GHUbXUfX'flck'Xc'mci'\_bck'k\Yb'mciBY'XcbYŁÁ

< Ugʻh\Y`G]hY`?`g\U`ck`[fcibXkUhYfiYaYXmVYYb`Wcad`YhYX`f]"Y'≊\UjY`h\Y`WYUbid``YjY`g`]b` HUV`Y`%cZh\Y`%-+`CI&`FC8`VYYb`UhU]bYX`h\fci[\cihk\Y`UYf]U`UbX`jYfh]WU`YIhYbhcZh\Y`G]hY`?` d`iaYb3Á

Þ[ĔÁUç^¦æ|É5c@Á^{ ^å^Á{ ¦ÂÚãr^ÁSÁ&[}cāj`^åÁ{[Á]^¦æer^Á&[}•ã:c^}cÁ,ão@A;æ•cA^æ•Áæ)åÁ§JÁ&[{]|ãæ)&^Á;ão@Á c@Á^``ã^åÁ,^\-{-{}{ { a) &^A&;ãr^}ãæEĂ

Væà∥^ÁJÉİÁ,¦^•^}œrÁs@ÁXUÔÁ;æ••Á^{ [çæakéaa)åÁ;[}c@;Ák[, Áææ\*•ÈÁ/@Áki^ææ{ ^}c%;ákæa};č¦^åAæa)åÁ d^ææ\*åÁÍÊE΀EEÍIÁ\*æak[]}•Á;Á,æe\*¦Á^•čkajá&@Á^{ [çæaká;Á:EFÁ;[č}å•Á;ÁXUÔ•Ák[{ák@ásěčã^¦Á§jÁØŸÁ GEFJĚA/@Ásč{č|ææãa;^ÁXUÔÁ;æ••Á^{ [çæakás:Á+UÏÁ;[č]å•Á;UÔ•ÈÁ

CE Á @ Ţ } Á; } ÁZE ヾ !^Á!Ë ÉAT }^ÁO €FJÁ/ÔÒÁ&[ } &^} dæaāţ } • Áæ) \*^åÁ¦[ { Á, [ } Ëå^c^&&ó{ξ ÁFÊ €€Áµ\* EŠEÁQ Á \*^} ^!æļÉÛã¢Ă, ãå^Á/ÔÒÁ&[ } &^} dæaāţ } • Á, ^!^Á[ \_ ^!Á@e) Á@ •^Á^] [ !c\*åÁşi ÁØŸÁO€FÌ ÈAT [ } ãt[ !ā] \* Á, ^||•Á €FWÎ FFÁe) å ÆFWÎ FÍ Á[ [ } ãt[ !^åÁœ Á&[ !^Á; Á∞@ Á] | { ^ÈAP[ \_ ^c^!ÉÅ ^||ÆEFWÎ FFÁ æ Á∞aàæ) å[ }^åÁşi ÁO€FI Á[ !Á •ã°Á^å^ç^|[ ] { ^} oÁ∞acaçãaã • Áæ) åÁ, āļ/á₂^Á^ā • œe|^åÁ; } &^Áœ Á^à^ç^|[ ] { ^} oÁ∞acaçããã • Áæ^Á&[ { ] |^c\*åLÁ •ã°Á^å^ç^|[ ] { ^} oÁ∞acaçãaã • Áæ) åÁ, āļ/á₂^Á^ā • œe|^åÁ; } &^Áœ Á^à^ç^|[ ] { ^} oÁ∞acaçããã • Áæ^Á&[ { ] |^c\*åLÁ •FWÎ FFÁ®ææÁæ Á∞çæājæai|^Á[ !ÁØŸÁO€FJÉÚ!ā] !Á[ Áœàæ) å[ ] { ^} dÉVÔÓÆ[ } &^} dæaāţ \* á] • Á∞á[ { ] |^c\*åLÁ] [ Á €FWÎ FFÁ@æåÁà^^} Á^|æaãç^|^ Á œæa|^Á; ç^!Áv@ Á; !^çãţ \* Á^çç^} Á^æ•ÉAæ) \* ā] \* Á'[ { Á Ê €€Áµ\* EŠÁţ ÁFFÊ€€EÁ µ\* EŠÉĂ

Ô[}&^}dæaā[}•Á[-Á\ÔÒÁ5jÁ[[}ãā[¦ā]\*Á]^||ÁEFW΀HÁ@anákæd] æ`•Ásh^}Å[}Ëä^c%&AQî^••Ás@anjÁFÈEÁµ\*EŠDĚÁ P[]^cç¦Éb5jÁT æ`ÁGEFIÊA/ÔÒÁ3jæ-Ásh^c&c%cåÁsacÁsaGÊEEEAµ\*EŠA5jÁEFW΀HÉAY^||ÁEFW΀HÁ]æ-Á^•æ{]|^åA5jÁ R'|^ÁGEFIÁQÉÊE €EÁµ\*EŠDÁsajåÂÛ^]c^{{a^{}}AGEFIÁQÊÊE €Aµ\*EŠDĚA/@AR'|^ÁsajåÂÛ^]c^{{a^{}}A^•ěa{}]|^\*Ás[}-ä{^åÁs@asA ^|^çæe\*åÁ8[}&^}dæaā])•Á[-Á(ÔÒÁsajåA[c@:¦ÁXUÔ•Ása+A];!^•^}d5jÁs@A], ^||ÈČ[[`}å]æe\*¦Á;A2[]|^•Á8[||^&c\*åÁ

#### Á ةUÔŒŠÁŸÒŒÜÁGEFJÁŒÞÞWŒŠÁÚÒÜØUÜTŒÞÔÒÁÜÒÚUÜVÁ

å[,}\*¦æåð}ó^{(A=FWÎ €HÁve Á), æid√(Afacú ÁSÁ\*^[]¦[à^Áşiç^•cāt æaā]}ÁşiÁÙ^]c^{(a^{A} @, ^åÁ@æaÁ@t @ÁVÔÒÁ &[}&^}c^\*cāt æaā]}•Á, ^¦^Á[&æajā ^åÁse) åÁ@æåÁ][d′(at læc^åÁ4][{Ás@Ási { ^åãæer Áça&ajār Á, Afa@ ÆFWÎ €HĚA/@Á \*^[]¦[à^Ásiç^•cāt æaā]}ÁşiÁOEFIÁs^c^!{a]^åÁs@æa⁄@aid[!a&æa]^Á@ti@ft'[`}å, æc^!Á/ç^|•ÁşiÁCE]¦ä/Asi åAT æੰÁOEFIÁ |ã^|^Á, [àājā ^åÁ/ÔÒÁşiÁs@Á[¦{ ^!Áid[!{Á^, ^!Ási^åå]\*Ás@æa⁄á;æiá]!^•^}o´{(a^{+})}á^{(a^{+})}} aátī á a]\*Ási@æaÁa] ^ÉA/ÔÒÁşiÁs@A[!{ ^!Áid[!{Á^, ^!Ási^åå]\*Ás@æa⁄á;æiá]!^•^}o´{(a^{+})}á^{(a^{+})}} @EFIÉÀJa] &^Ás@æaÁaj ^ÉA/ÔÒÁs[}&^}de A de EFIÉÀJa] &^Ása@æaÁaj ^ÉA/ÔÒÁs[}&^}de A

Y^||ÁEFWÎFÏÁ&[}cāj`^•Á{[Á¢@aàācÁ[, Áse)åÁ^|æaã;^|^Á&[}•ã c^}ó&[}&^}d&[}&^}d&[}&A; å[,}\*¦æåå}oA;Áx@A`¦[`}å, æc^¦Á&[||^&cā]}Á^•c^{{ op /&eaij č \^Á[}}KA[}&A;}dæaā]}oA;Ac@A&[}&A; &[}•ã c~}oA;ão@ko@[•^Á{ ^æ č \^åÁsjÁOŸÁGEFIÁse)åÁ;\^çãjč•Á^æ+ĚV@A&^c>&c^åArÉEEäã&@[[ [^c@}}^Á &[}&A;]&A;dæaā]}Áa;Áa^|[, Ás@Á&J^æ}]Á^c^|Á[¦ÁÜãc/ÁSĚÅ

### 8 c UXX]lijcbU fYa YX]U a YUgi fYg bYYX hc VY UXXfYggYX3 ...

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# - '%\$` Ch\ Yf `F Y`UhYX`5 W]j ]hm]b`: M[&\$%`

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ÈÁ

# 10Á CD9F56 @9'I B=H'& '6I =@8=B; '%\$&'G<5 @@CK' ; FCI B8K5H9F'

V@Á{[ {{ ^ | ÁO`ā¦åā] \* ÁF€GÉÁ @ , } Á; } Á@ã` ¦^ÁF€ËFÉÁ, æ Á&[ } • d`&cvåÁ\$jÁFJIGÁsej å Á • ^åÁ; ^ ¦āį å a8æa|î Á } dā/kó@Á FJÌ€•Á{[ ¦Á; | [a`&cāi] } Á; -Á { æ|Á&æajāa^¦Áset { `} ãaā] } Ásej å Áçæalāj` • Á; c@ ¦Á; `} ãaāj } • Á&[ { ] [ } ^ } œ ÉÓ^c, ^^ } Á T æ&@ÁOEECÁsej å ÁØ^à i`æ^ÂOEEI ÉÁ @æh[[, ÁÇW} ãoÁFDÁ\*|[`} å, æc^¦Á\$[ ] æ&oÁ; æ Áåãa &[ ç^¦^åÁ { æ) æaāj \* Á+[ { Á à^} ^æ@ÁO`ā¦åāj \* ÁF€CÁÇããa &[ ç^¦^å/ås`i]ā \* Ás@ ÁÚ@æ ^ÁQásej å ÁÚ@æ ^ÁQÁO}; çã[ } { ^} œ ÁÛãc^ÁOE • ^ • • { ^} có§ Á • `] ] [ ¦oÁ; ÁseÁ`č ¦^Á/ÔOEDÉÚÁ; [] ^ ¦c Ástæ) • - ^ !DĚÁ

V@ Áå∧&ãa āļ}Át[Á] [[&^^å Å jā@ÁTÞOEÅ, æe Áaæe ^å A[}Á d []\* Áçãa^}&^Á+[{ Á, æe^¦Á \* ædáč Á; [}ãt[¦ā]\* Ága≥ ÈÉÁ å^\*!æåææāį}Á] ![å\* &o• DÁæ) å A[}ÁT ÚÔOEÁ, &&![&[o+{Árčå & o+A} @ & @ & @ & A[] { Á, æe^¦Á \* ædáč Á; [}ãt['ā]\*Ága> ÈÁ Ó \* ajå āj \* ÁF€GÁ\*![\*}å, æe^!Á, æe A[&&\*'!!ā]\* Á∞eA\*`à• œa) œædÁæe^• ÈÁU \* &@ & & \* !æåææāį}Áxeso• Át[Á^å\* &^AÔUÔA; æ• Á æ) å A[[àājāč Áa^Áa]^ æa a]\* Áa[], }Ác@ ÁÔUÔ• Áxe• Ás@^^A(ā\*!æe^ÈÁ/@ Aa^&ãa āj}Át[A]![&^^å, å@ AT ÞOEÁ; æe Áed+[Á àæo^å A[}Áx@ Áxeà•) &^A[-Áxe)^A\*![\*}å, æe^!Á^&/]q['•ÈÁ

# %\$'%FYa YXm7ca dcbYbh; %`Acb]hcfYX`BUhi fU`5hhYbi Uhjcb`

8 YgW]dh]cb.Á\& /  $A_{i} = A_$ 

#### DYfZcfaUbWY`GHUbXUfX`flck`Xc`mci`\_bck`k\Yb`mciBY`XcbYL`

Y@}ÁxaÁ,[}ãā[¦ā]\*Áj¦[\*¦æ‡,ÁñerÁt•cæaà|ãe@a°Ébaa)a'Á,[}ãã[¦ā]\*ÁñerÁbjÁ&[{]|ãaa)&^Á,ão@Ao@A^\*\*|ææ[¦Ása]]¦[ç^a.Á OE;}čæ4ÁT[}ãã[¦ā]\*ÁÚ|æa)ÈÁ

#### =g'h\Y'fYa YXmWca dcbYbh'VY]b[ ']a d`Ya YbhYX3'

Ÿ^•EĂQĘ]^}åã¢ÁQEÁ\*`{{ ælā ^•Áx@AØŸÁQEFJÁ;[}ãų[¦ãj\*Á;|æ)Áæ)åÁæ)^Á&^çãæeãų}•Áæl^Ár¢]|æ3j^åÁ§JÁ QĘ]^}åã¢ÁQÊEÈÄÖ^œaãj•Á;4x@A\*![`}å, æev¦Á;[}ãų[¦ãj\*Á;l[\*¦æ;Áæl^Ásãa&`••^åÁ§JÁc@A,^¢oÁ^&cãų}È

# %\$"&`FYa YXm7ca dcbYbh [&`; fci bXk UhYf`Acb]hcf]b[`

8 YgW]dh]cb.Ákū¦[`}å, æe∿¦Á;[}ãt[¦ā)\*Át[Átiæ&\Á^{ ^å^Á,^¦+[¦{æ})&^Áæ)åÁt[Áç^¦ã÷Áx@æe⁄t\*¦[`}å, æe∿¦Á ¦^æ&@3)\*ÁÜ&&^ÁÔ¦^^\Ás[^•Á;[oÁv¢&^^åÁrœe⁄Á`¦-æ&^Á;æe∿¦Árœa)åætå•+ÁçUWGÁÜUÖÁOE;^}å{ ^}å{ ^}óÁtlÁçGEFGDÉÁ ]æt\*Á ÉEDDÉA

#### DYfZcfaUbWY`GHUbXUfX`flck`Xc`mci`\_bck`k\Yb`mciBY`XcbYŁÁ

#### =gʻh\]gʻfYaYXmWcadcbYbhVY]b[`]ad`YaYbhYX3Á

T [}ãt[¦ā]\*Át[¦ÁFÊIËäāt[¢æ)^Á,æ•Á^]^æ¢å/åi`¦ā]\*ÁØŸÁGEFJÁ`{ { ^¦Áæt[]|ā]\*Át[Áç^¦ã²ÁœexAFÊIËäat[¢æ)^ÁaiÁ }[cÁæAÔUÔÁajÁÔ`ājåā]\*ÁF€GÁ@ea|[\_Á\*|[`}å\_aex\İÄOEAA@t]`Á\*@t]`åa, aex\İÄOEAA@t]>ÁşÁA@exAFÊIËäat[¢æ]^Áai åāt[¢æ]^ÁæeAEFŠÍÌGA(ÁEÈEHIÁRÁu\*EŠÁ@e\ARÁsi^][c\*Ak@iA^\*io#áA\*áaAæiA\*ata&a\*aA\*ata&a\*aA\*ata ã\*Ás^|[\_Ác@Áæei[¦æet[¦^Á^][¦cā]\*Áat[ãoÁÈAT[]ãt[¦ā]\*Át[¦ÁFÊIËäat[¢æ]^Á;at|Ása^Asias&[]cā]`^åAsjÁÔ`ājåā]\*ÁF€GÁ •@ea|[\_Át¦[`}å\_æex\ÌÉĂ

#### K YfY'N Y'[ fci bXk UNYf'a cb]hcf]b[ 'fYei ]fYa Ybhg'Zcf'N ]g'fYa YXma Yh8''

Ÿ^∙ĔĂ

#### =g`Ubmi[fcibXkUhYf`gUad`]b[`dfcdcgYX`df]cf`hc`h\Y`bYIhifYdcfh3Á

Ÿ^•ÈŁŐ¦[`}å, æz^¦Á([}ãt[¦ā)\*ÁeœAÓča¦åa)\*ÁF€GÁ, a]|Áa\^Aayi Áese&&[¦åæ)-&^Á, ão@Ao@A([}ãt[¦ā)\*Á,|æ),Á@(,}}Áa)Á CE[]^}åãeÁOEEEÁ

#### 5 fY`Ubm'W{ Ub[Yg`cf`UXX]h]cbU`UWF]cbg`fYei]fYX`Zcf`h]g`fYa YXmWcadcbYbh3Á

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# **%**" `F Ya YXm7 ca dcbYbh, ' .`@UbX`l gY`7 cbffc`g`

8 YgW]dh]cb.Á&MÔ•ÁţÁ^•d&380Á§•œaa|aæaā}Ą(,~Á, æe^\A`]]|^Á,^||•Á§q(Á@A&[}œa{ā}æe^åAj[¦œā}A(,~Á@ÁN}ãAFÁ æĭã^¦Áæ)åÁţÁj¦[c^&oÁx@/Á§-¦æed`&c`¦^Á^|æe^åÁţÁœãáÁæe^¦}ææãç^ÁQ;[}ãt[¦ā]\*Á,^||•DAQUWGÄÜUÖÁ Ot;^}å{ ^}œ{{ } oÁklÁQGEFCDÉAjæ\*^Á.ÉEDDĂ

DYfZcfaUbWY`GHUbXUfX`flck`Xc`mci`\_bck`k\Yb`mciBY`XcbYL`

Q ] |^{ ^} caeaaaa } Aa - As@ ASWO• A, aa|A&[ } caa, ` ^ A´ } caa, A´ \* & @ As@exa, As@exa, As@exa, As[ } & ^ As@exa, As[ } & ^ As@exa, As[ } & ^ As@exa, As[ } & A = As@exa, As[ ] & A = As@exa, As[ ] & A = As@exa, As[ ] & A = As@exa, As[ ] & A = As@exa, As[ ] & A = As@exa, As[ ] & A = As@exa, As[ ] & A = As@exa, As[ ] & A = As@exa, As[ ] & A = As@exa, As[ ] & A = As@exa, As[ ] & A = As@exa, As[ ] & A = As@exa, As[ ] & A = As@exa, As[ ] & A = As@exa, As[ ] & A = As@exa, As[ ] & A = As@exa, As[ ] & A = As@exa, As@e

< UgʻUʻ@;7F8`XcWia Ybh'VYYbʻUddfcjYX`hcʻUXXfYggʻ@;7`]ggiYgʻ2cf`CI&z̃]bWiX]b[`6i]`X]b[`%\$&` [fcibXkUhYfžUbX`]gʻ]h'VY]b[`]ad`YaYbhYX3`

Ÿ^•ÈÁ/@ Á/\ÙÒÚOE&e)åÁT ÚÔOEA,¦[çãá^å&{[}•ãrc}}&^Áea]]¦[çæaÁ4[¦Ác@ ÁU NGÁŠMÔÜÖÁ§JÁU^]c^{à^¦ÁGEF€Ae)åÁ ãrÁs^āj\*Ás[]|^{ ^} cåásî Ác@ ÁOE{ ^ÈÁUǐà•^ĭ^}c4^çãra[}•A(Ac@AŠWÔÜÖÁ@eç^A),[cÁ&@ee)\*^åÁc@ Á \*¦[ĭ}å, æc^¦ÁŠWÔ•Á4[¦ÁÓĭāpåā]\*Á≂€GEÁ

K UgʻUbʻUbbi Uʻg]hYʻ]bgdYWFjcbʻZcfʻ@r7gʻWcbXiWhYX`]bʻ: Mf&\$%3Á

Ÿ^•ÈÁU}ÁR`}^ÁFJÉKGEFJÉks@ÁCE{ ^ÉATÞCEÜÞŐÉkæ)åÁRXÁ&[}å`&c^åÁs@Áxe)}`æ‡Á§•]^&caį/§j·Å,~ÁUWCÁ+ãc^•ÈÁ/@Á &[{]|^c^åÁs&@&\|ã=cÁ+[{ Ás@Á§•]^&cai}}&kaj&s|`å^åÁse ÁCE]]^}åãrÁzDÉÁ

8]X'h\Y`]bgdYWhjcb`]XYbhjZmUbmiZc``ck!id`UWhjcbg`bYYXYX'hc`aUjbhUjb`h\Y`dfchYWhjjYbYgg`cZh\Y` @r7g3Á

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# %\$"(`Cj YfU``F Ya YXmZcf'6 i ]`X]b[ '%\$&'G\ U`ck '; fci bXk UhYf'

#### DYfZcfaUbWY`GHUbXUfX`flck`Xc`mci`\_bck`k\Yb`mciBY`XcbYŁÁ

Y@}Ác@Á&|^æ)`]Árç^|•Á§ÁUWGÁÜUÖÁCĘ^}å{ ^}å{ ^}óÀIÁÇCEFGDÁ@æçrÁ&r^}Áæcæa∄ ^åÁc@[`\*@[`M@Áœkær¦ãædÁ æ)åÁç^¦œ3&ædÁr¢cr}oA[×Ác@ÁÓ`āþåā]\*Á∓€GÁ,|`{ ^ÁÇUWGÁÜUÖÁCĘ ^}å{ ^}óÀIÁÇCEFGDÁ§ æt ^ÁGËFHDDÁ

< Ugʻr\Yʻ6 i j`Xjb[ʻ%\$&`g\U`ck`[fcibXkUhYf`fYaYXmVYYb`Wcad`YhYXʻfj"Yʻz"\UjYʻr\YWYUbid``YjY`g`]b` \Y`HUV`Y`cb`DU[Y`&!%`cZCI&`FC8`5 aYbXaYbh`(ʻfB\$%&L`VYYb`UHHUjbYX`l\fci[\cih\Y`UYf]U`UbX` jYfhjWU`YIhYbhcZh\Y`6 ij`Xjb[`%\$&'d`iaYt3Á

Þ[ĔÁOEÁ@,}}Á§Á⁄æà|^Á<del>F€ËC</del>É&A|^æ)`]Á^ç^|•Á@æç^Á,[dáa^^}Á^æ&@åÁs@[`\*@`dác@Áæé¦ãæþÁ¢¢d}dá,-á@Á ]|`{ ^Áæ}åÁs@Á`ãc^Á&æ}}[dáa^Á&|[•^åÈÁ/ÔÒÁ&[}&^}dæaā]}•Á¢¢&^^åÁs@Á&|^æ)`]Á^ç^|Á§Ás@^^Á,[}ãt[¦ā]\*Á \_ ^||•ÉÁ

#### K\Uhi]adUWhi]g`AB5`\Uj]b[`cb`WcbHLa]bUbhWcbWYbhfUhjcbg3`Á

Þæč¦æþÁææc^}`ææāį}Á&[}œj`^•ÁţÁţ&&`¦ÉÅ,ão@ÁvÔÒÁa^āj\*Ás@Aj¦āįæ^ÁXUÔÁ,¦^•^}œ4\$jÁ@A`[`¦&^ÁæA æÁ ç&&ājãčÉ&æjåÁj¦āįæ^Áa^\*¦æåææaţ}Áj¦[å`&orÆa^āj\*Áj¦^•^}œ4\$jÁ&[]}\*';æåā\*}œÁ^/||•ÁÇÈ ÉÉAj¦ājæajã^&ãë ËFÊEËÁ ÖÔÒÁæjåÁçāj^|Á&@[¦ãa^Á\$jÁEFŠÍÌ|ÁæjåÁEFWÍÌ|DĚÁÙã\*}ã&&æjœ4&@æj\*^•Ás@æeÁ,^¦^Á,[c^å/45jÁs@AØŸÁGEFJÁ \*'|[`}å\_æe^¦Á`æ†ãčÁ^•`|orÁ5j&]`å^KÁ

- •Á €FWÍÏJÁsa) åÁ€FWÍÌ€ÁÇI[`¦&^Ásab adDÁVÔÒÁ&[}&^} dæati}Åå^&aDÁVÔÒÁ&[}&^} dæati}Åå^&aDÁVÔÒÁ&[}&^} dæati}Åå^&aDÁVÔÒÁ&[}&^} dæati}Åå^&aDÁVÔÒÁ&[}&^} dæati}Åå^&aA
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- •Á €FŠÍÌGÁÇצc@;¦&i[,}\*¦æåå}o4, -Ás@;Á[`¦&^Ás@;Á[`¦&^Ásd^æðAðDÁÔ[}&^} dæaā]; Á;-Ásãa ËFÊEËÖÔÒÁå^&¦^æ^åÁQFÎÁµ\*EŠÁ qíÂËÁ\*EŠDÁQ;^ç^¦És@áA, ^||Ásd]]^æb•ÁqíÁsà^Ácæà|^Ásda å/ãa ÁcāļÁsh^|[, Ás@;Ásl^æ)`]Á^ç^|Á;-Ái€Áµ\*EŠÉĂ V@;Áçā]^|Á&QQ[¦ãa^Á&[}&^} dæaā]; Ásh^&¦^æ^åÁqíÁEÈEÎÁµ\*EŠÉÁ, @38.@ásáà^|[, Ás@;ÁO`ājàā]\*ÁF€GÁ&|^æ)`]Á |^ç^|ÉÁ
- •Á €FWEIÌÁĢæåbæ&^}cÁţÁÜ&&^ÁÔ¦^^\ DAFÊÁst⢿aj^Á, æÁ[cásh^c%&cå/k§á@æÁ, ^||ÁşÁØŸÁG€FÌÁ;¦ÁG€FJÈÆÊËÄ Öð⢿aj^Á, æÁsh~c%&cå/kæc/ÆÈÉAu\*tŠSÁşÁØŸÁG€FÏÊbæà[c^Ak@ATÖPAFÜŠÁţÁÆÈEÁu\*tŠŠĚV@ÆÊÊäðaţ¢æaj^Á &[}&^}dææða}/Áş&'^æ^åÁşÁs@Aj¦^çãt`•Ás@^^Á^æ•Á; [}ãt[¦ð]\*LÁs@áÁ, ^||Á, æÁ,[}Ëå^c%&A{[kfÊË åãt¢æaj^ÁşÁG€FÍÁsajåÁ@æå/Ása4&[}&^}dææðajÁ, ÁÆÈÉÍÁu\*tŠÁşÁG€FÎÈA

### KYfY'Ubmilf][[Yf``YjY`g'YlWYYXYX'Uhil\Y'Wcbhjb[YbWh`cWUhjcb3`

Þ[ĚÁ/@,Á&[}cā]\*^}&`Á[&ææā]}ǼF/VEIÌÉA[&ææ^åÅ,^¢ó&[ÁÜ&&^ÁÔ¦^^\ÈÁ/@,Ád]å\*^¦Á^ç^|ǼFAČ \*'[č]å,æe^¦Á&|^æ}`]Á^ç^|•Á,¦ÉABJÁ©,Á&æ\*^Á,ÁFÊEäã[¢æ}AÉ©ATÖPÁ?ÜŠEAP[ÁÔUÔ•Á[¦ÁÔčãå]\*ÁF€CÁ •@æ|[,Á\*¦[č]å,æe^¦Á\*¢&^^å^åÁs@~ãÁ^•]^&cãç^Á&|^æ}`]Á^ç^|•ÁBJÁOŸÁ©EFJÁÇ<mark>/æ</mark>|/Á<del>F€ËCIDĂ</del>

#### 8 c UXX]lijcbU fYa YX]U a YUgi fYg bYYX hc VY UXXfYggYX3

$$\begin{split} \mathsf{P}[\check{\mathbf{E}}\mathsf{P}[, \wedge\varsigma^{+}]\check{\mathbf{E}}\check{\mathbf{a}}\check{\mathbf{A}} ( \circ a \acute{\mathbf{A}} ( \circ a$$

$$\begin{split} & (\hat{A} \wedge \bullet \hat{C}_{A} [1 \setminus \hat{g} * \hat{A}) \hat{A}_{A} \otimes \hat{A} \otimes \hat{A}_{A} \otimes \hat{A}_{A} \otimes \hat{A} \otimes \hat{A}_{A} \otimes \hat{A}$$

#### Á ØÒÙÔŒŠÁŸÒŒÜÁƏ€FJÁŒÞÞ₩ŒŠÁÚÒÜØUÜTŒÞÔÒÁÜÒÚUÜVÁ

-{ ||[, ā) \* Á^>æ&@Á^ç^} dĚk2[ ¦ÁæÁ( [ ¦^Ás^^œaah^å Á` { { æb^ Á( -Ás@^ ÁÜ a&^ÁÔ ¦^^\ ÁÜ^{ ^aeh} å^\á'![`}å, æe^!Á { [}ãu[¦ā] \* ÉÁ^-^\áu[ÁÔæô Á⁄ ^● dÉA©€FJÁs) &|ĭå^åÁœá Á0E[]^} åã¢ÁÕ ĚÁ

 $\begin{aligned} & Q^{A} (Q^{*} | a Astep [As^{A}, [c^{a} A so Qeee A^{C}] & a \in A^{A} (C^{*} | a = A^{A}, [c^{a} A so Qeee A^{C}] & a \in A^{A} (C^{*} | a = A^{A}, [c^{a} A A so Qeee A^{C}] & a \in A^{A} (C^{*} | a = A^{A}, [c^{a} A A so Qeee A^{C}] & a \in A^{A} (C^{*} | a = A^{A}, [c^{a} A A so Qeee A^{C}] & a \in A^{A} (C^{*} | a = A^{A}, [c^{a} A A so Qeee A^{C}] & a \in A^{A} (C^{*} | a = A^{A}, [c^{a} A A so Qeee A^{C}] & a \in A^{A} (C^{*} | a = A^{A}, [c^{a} A A so Qeee A^{C}] & a \in A^{A} (C^{*} | a = A^{A}, [c^{a} A A so Qeee A^{C}] & a \in A^{A} (C^{*} | a = A^{A}, [c^{a} A A so Qeee A^{C}] & a \in A^{A} (C^{*} | a = A^{A}, [c^{a} A A so A^{A}, [c^{$ 

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# 11Á CD9F56 @9'I B+H'& '5 EI 5 H=7'G+H9G'

V@ÁNÙÒÚŒaaayàáT ÚÔŒáy¦[çãã∧åÁ&[}•ã ch}&îÁ[ k@ÁÜã&∧ÁÔ¦^^\ÉÀÙ } -ã @ÁŠæà∧ÉAT æt•å^}ÁŠæà∧ÉAT æt•å^}ÁŠæà∧ÉAT æt•å^}ÁŠæà∧ÉAT æt•å^}ÁŠæà∧ÉAT æt•å^}ÁŠæà∧ÉAT æt•å^}ÁŠæà∧ÉAT æt•å^}ÁŠæà∧ÉAT æt•å^}ÁŠæà∧ÉAT æt•å^}ÁŠæà∧ÁÞ[ ¦c@ÉÁ æ)åÁT æt•å^}ÁŠæà∧ÁÙ[ čc@ÉAŒÁ∧{ ^å^Á, ærÁ∧&[ { { ^}å^åÁ{[ ¦ÁÚ] }åÅŐÁQē ` ¦-æ&A,Á æt+Á@ætå}^••Áæåbੱ•c{ ^}cA}cDÁ q!ÁæcæanajÁ&[ { ] |ãæa)&^Á,ão@Ác@ÁT ā} }^•[ ææÁ`¦-æ&A,Á æt\*¦Ácæa)åætåÁ{[ ¦Á/æåÁQÔ|æt•ÁCÓåÁ&@[ }ã&Ácæa)åætåEA UWGÁÜÜÖÁQE[ ^}å{ ^}cÂA ÁQEFCEDÉÁ @ã&@áb[ & { ^}crÁ^|^&cā] }át~ák@Á^&[ { { ^}å^åAá¢dc\*¦}ææãç^ÉÁ; ærÁ •ã }^åÁsJÁRæaj čætÁQEFCEDÉÁ

$$\begin{split} & \forall \otimes AVUOUDE = a^{A}VUOE = a^{A}VU$$

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# 12Á CD9F56 @9'I B+H'& '899D'; FCI B8K5H9F'

V@ Á^|^&& åÁ{ { ^å^Á{ ¦Å\$@ ÁÖ^^] ÁÕ¦[`}å, æv ¦Á\$j Á\$@ ÁFJJÏ ÁJWGÁÜUÖÁ&[}•ã o Áţ Á4ξ,^Á4, { ^åãedÁ &[{][}^}o Ás@eerÁ\$j &|`å^Á&[}cāj`^åÁ`•^Áţ Ás@ Á/ÕÜÙÊŞ ãt@4ţ [åãa38æedā]}•Áξ Áξ ] ¦[ç^ÁXUÔÁ^{ [çædÁ'[{ Ás@ Á •[`'&^Áed^ædÁdAde [ Á5j &|`å^•Áed}}`ædÁ^çār, Áţ Á,o, Áed}åÁ { ^!\*āj\*Áv&@?[|[\*ā?•Á,[c\*]cāedţî Áed]]|a8æada|^Át[Á c@ ÁÖ^^] ÁÕ¦[`}å, æv ¦ÉZ/@árÁ^][¦c4å[&`{ ^}o Áed|Áj^¦-[¦{ æd} &^Áed}åÁt[}ãt[¦āj\*Áåæææá&[||^&c\*åÁ4][ Á U&ctjà^¦ÁGEFÌÁs@[`\*@ÁÙ^]c\*{à^!ÁGEFJĚÁ

#### <]ghcf]WU`8 Yg][b`UbX`9jU`iUh]cb`cZH; FG`FYaYX]U`5Wh]cbÁ

V@^ÁFJÌJÁQE;} ă¢ÁT[}ãd;¦āj\*ÁÜ^][¦cÁjæa Ás@^Áā+oÁ^][¦cÁs[ç^¦āj\*Ás@^Á\*||^Ás[}-āt`¦^åÅ/ÕÜÙÉÁj@B&@Á &[}&]`å^åÅs@enskanf&[}cāj`[`+Á[}^Á;Ásæa]č¦^Éæa]]¦[¢ā[æz^\^Á,ÉE€Á^^cÁjāa^ÉÁjæa /Ås^ç^|[]^åÅsænks@ VÔCEDEÚÁ;¦[]^¦c´Ás[`}åæb^ĚÁ'@^Á[}^Á;Ásæa]č¦^Ájãa^}^åÁs[Ása]]¦[¢ā[æz^\^Â.ÊHE€Á^^cÁ]\*¦æåð\*}cÆjÅ à[`}åæb^ĚÁ'@āA{[}^Á;Ásæa]č¦^Á;æa /ås^ç^|[]^åÅsænksæç^¦æ\*^Ár^•c^{{}jā]\*Áæz^+A;ÁCEÉ€Æ{A[ÁCEÉ€Æ{A]{ ÉE

U]^¦æaāį}Ą́, Aś@ Á/ÕÜÜÁ{{ ^å^Â@ee /áa^} Á? ~~&&aãç^Á§i, Á/a\* &ðj \* ÁÔUÔÁ&[}&^} dæaāt} • Ásen Á, ^æd|^ Ásed|ÁUWGÁ { [}ãī[ ¦ðj \* Á, ^||• Ás^ Á;ç^¦ Ásed]] ![çāt] æe^|^ Á;}^Á; ¦å^¦ Á; Á#; æt}ãt`å^ÈÄÜðt}ãā&æd; oÁ^å`&aāt} • Áşi Á/ÔÒÁ &[}&^} dæaāt} • Á, ^!^ Árçãa^} oÁs`i ¦ðj \* Ás@ Áræd|^ ÁFJJ €• LÁQu, ^ç^¦ÉA [[, ^¦Á/|æaãto^Ás^& &dj] • Áşi Á/ÔÒÁ &[}&^} dæaāt} } Á@eç^ Á; &&` !!^ å A;ç^¦ Ás@ Áræd|^ ÁFE Át ÁGE Á ^æd• ÈÅDE Á^{ a\* EAUðt} { ^a^A A;cã\*, Á;æ A&[ð] ^\* Aset} à Áset]] ![ç^å Á &[}&^} dæaāt} } Á@eç^ Á; &&` !!^ å A;ç^¦ Ás@ Áræd f Æ Át ÁGE Á ^æd• ÈÅDE Á^{ a\* EAUðt} { ^a^A A;cã\*, Á;æ A&[} å` &c^å A &dj] ![ç^å Á à^ Ás@ Á^\*` |æat !• Áşi ÁT`} ^ ÁGE FÌ ÈÁ/@ár Á^] [ !o4; !^• ^} or Át ] ![ç^{ { ^} or Át ! Á&[} •ãa^!æaāt} } Át ,æd Å;ç^!æd Át æ• Á !^{ [çædÁsej} å Á/ÕÜÜÁ;] ^!æaāt} ædÁ~ædð} & ÈÁ

Q ÁØŸ Á GEEHÉ&@ ÁŒ{ ^ Á^& & ç^åÁ^\*\* |æt[ ¦^ Áse]] ¦[çæq4, } Ás@ Á/ŐÜÙÁU] ^ ¦ætāj \* ÁÙd æz^\*^ ÁÇU ÙDÁs[& `{ ^} dĚ / @ Á UÙÁ, æ-Ásæ-^åÉ&s, Á, ædÉ4, } Á5, å5, å5, \* eÅ'[{ Ás@ ÁFJÌJÁ0E; }`æ¢AT[}ãt[¦ã;\*ÁÜ^][ ¦dĚ / @ ÁUÙÁ, ¦^•^} & å ÁseÁ Õ|[àæ¢ÁU] ^ ¦ætāj \* ÁÙd æz^\*^ ÁÇÕUÙDÁt[ ¦Ás@ Á\*} cã^Á / ÕÜÙÁr¢d æ3caf; } Á^ • e^{{ Áse} å ÁseÁTāsk'[ÁU] ^ ¦ætāj \* ÁÙd æz^\* ^ Á QTUÙDÁt[ ¦Á^/|^&c\*åÅ, ^ ||Á\*¦[ `]•ÈÄÒçæ‡ĭætāj }•Á;[ , Ás[ }•ãa^ ¦Ásej å Ást[{ ] æd^Áse3cī æ4, `{ ] ð}\*Áæzet eÆ æj åÁTUÙÁæze\*•Á; ¦^•^} e\*åÆst Ác@ Á263; æ¢A/ÕÜÙÁUÙÉÅ

Q ÁGEFHÉ&@ ÁT ∄}^•[œáÙæ^ÁÖ¦∄\∄\*ÁY æc∿¦Ãšã[ãáQPÜŠDÁ{¦ÁrÊE Ёãã[œa)^ÁQa)Á{{^!\*∄\*ÂÔUÔDÁ;æ Á^å &^åÁ ⊹[{ÁH€Áµ\*EŠÁ{[ÁrÁµ\*EŠÉQA Áæ|^ÁGEFÍÊE Ёãã[¢æa)^Á;æ Áå^ơ&& °åÁBjÁp^, ÁÓ¦ãt@{[}qA;æc∿¦Á`]]|^Áæa][ç^Ás@A PÜŠĚQA fræ&&@AGEFÍÊEWÙÒÚCEæa)åArÚÔCEA^``^•♂åAíæ{]|∄\*Áæa)åÁæa)æ\*,•ãA{{¦ÁrÊE Ёãã[¢æa)^Á{[Ás∿ÁB]&{`å^åA Á ةUÔŒŠÁŸÒŒÜÁGEFJÁŒÞÞWŒŠÁÚÒÜØUÜTŒÞÔÒÁÜÒÚUÜVÁ

ĝi ÁGEFÍ Ása) å ÁGEFÎ Á/ÔOEDEÚ/A'¦[`}å, æe∿¦Áræ{]|ð] \* Á∿ç^}or ÁsceÁUWFÉÁUWGÉÁsa) å ÁUWHÁ([}ãt[¦ð] \* Ása) å Á ^¢dæskca[}}Á, ^∥।•ÈÁOE[Á[&ææa]}•Áræ{]|^å Á^¢&^]O4s;[Á[, Ás@ Á^¢dæskca[}}Á, ^||•ÁQÓFÁsa) å ÁÓFFDÁ@æå ÁFÉÉ Eåð[¢æa) ^ Á &[}&^}dæaā]}•Á^¢&^^åð] \* Ás@ ÁPÜŠÉÁUæ{]|^•Á&[||^&c^å Á4¦[{ Ás@ Á/ÕÜÙÆ6],4`^}ofsa) å Áv⊶|`^}ofsaj å 88æer^å Ás@æaÁ }[ÁFÉÉ Eåð[¢æa) ^ Á&[}&^}dæaā] } Á^å`&caā]}Á, ær Ásæ&&[{]|ãr@ å Åa^Ás@ Ás<sup>\*</sup>aæ{,4}ofsa; As@ Á×or{}EÅ

V@ÁOE{ ^Á@ze Á&[{]|^c^åÁs@ Á\$jç^•cãtaæa‡]}Áţ-Ás@ ÁÙãc^ÁÖÉŹŐÁsa)åÁQár[`¦&^Ásd-^aze Ása)åÁ@ze Áţ¦[][•^åÁ§j•caa|jā)\*Á `]Át[Áç][Á\¢da&a3ca‡}}Á,^||•ÁsazÁÜãc^ÁŐÁt[Á&aa]c`¦^ÁFÊE Ëåj‡[¢aa}^Ása)åÁt^aze/≸aÁsh,^\_\_Át^aæ{\_^}œ^A;\*C{ÈOE ÁsaÁ ¦^•`|dŹfFÊE Ëäj‡[¢aa}^Á&[}&^}daæa‡]}•Á§jq[Ás@A/ÕÜÙÁt^aæ{\_^}œA;^ec{{ Ásd^A(¢]^8cc^Åk[Ása^&t^ae^ÈA

### <u>H; FG`AcX]Z[WUh]cbg</u>`

- A Ö^•ã } Áş a Ağ (3)•d \* a Aş (4)
- •Á OEāåãāā; }Á; -Áã čãaÁ; @ze ^Áť; a) č |adÁse3cã; az våÁsada; ]ÁţŠÕOEÔDÁse ÁsaÁ č] ] |^{ ^} ó; iÁqev; }asã; ^Át[Ás@A ^¢ã cã; \*ÁsãaÁ dā; ]ā \*Át^aæ; ^} ó4 ^• or { ĚšÁ

O5ååããą[}æa¦Áā≻¦åÁrčå^Áq[Áå∧ơ∿¦{āj^Áq[] cā[æa¦Á[&ææā;]}●Á[¦Ás@A,^,Ár¢dæ&cā;}Á,^||●Á&[}cāj`^åÁs@[`\*@ks@A ¦^{æājå^¦Á[ÁdØŸG€FJÈÁÁ

Q[¦Á;[¦^Ásh^œaa;h^åÁsä?&\*••ā;}Á;}Á@àrd;¦&&aa;A;[åãa&aaeaā;}•Á^-^¦Á;[Á;¦^çā;\*•ÁOEÚÜ•ÈÁ

# % FYa YXm7 ca dcbYbh, %`<mXfUi `]W7 cbHJba YbhUbX` 7 cbHJa ]bUbhFYa cj U Zica 'h Y Gci fW7 5 fYU

8 YgW]dh]cb.Ákū¦[`}å, æe^¦Á\*¢dæ&caā;}Át[Á@妿ĕ|&&æe‡|^Á&[}ææājÁx@Á&[}ææ5;åÁ\*[`¦&^Áæ4^æÁv@{[`¦&^Áæ4^æÁv@{[`k@Á Áµ\*⊞ŠÁ VÔÒÁ&[}&^}dææā]}Á&[}d[`¦ÁæajåÁ]]cā[ã^Áx@Á^{[çæ4Á]4ÔUÔ•Á+[{ Áx@Á[`¦&^Áæ4^æÁv@[`\*@Á]`{]ā]\*Á[-Á •^|^&c4, ^||•Èa4QFJJÏÁUWCAÜUÖÉAjæ\*^Á+DEÁ

#### DYf2cfaUbWY`GHUbXUfX`flck`Xc`mci`\_bck`k\Yb`mciBY`XcbYŁÁ

Y@}Ác@Á/ÕÜÙÆsiÁ&[}cæajā]\*Ác@Á&[}cæajā]æc^åÁ{[`¦&^Áæa^æák[Ác@ÁiÁµ\*EŠÁ/ÔÒÁ&[}d[`¦Áæ)åÁc@Á^•c^{ÆsiÁ []^¦æc^åÁk[Á;æc‡ā]ã^Ác@ÁÔUÔÁ^{ [çæa¦Á¦[{Ác@Á![`¦&^Áæa^æáA

#### =g'h\Y'fYa YXmWca dcbYbhVY]b[ ']a d`Ya YbhYX3Á

Ÿ^•ĚÁ / @ Á/ŐÜÙÁ[] ^ ¦æz ^ å ÁBJÁ ØŸÁGEFJÁ&[} •ã c ~ } o Áj áz @ ko@ Á^ č ã^{ ~ } o Áj Á @ ÁFJJÏÁJWGÁÜUÖÈÁ / æè |^ÁFGËFÁ ] ¦^•^} o Ás@ Á/ŐÜÙÁ&[^æ)č]Á^ č ã^{ ~ } o Áj ^ ¦ Ás@ ÁFJJÏÁJWGÁÜUÖÈÖč ¦ āj \* ÁØŸÁGEFJÉ&@ Á/ŐÜÙÁ&ç ^ ¦æt ^ Á ^ c clæ&cāj } Áæz ^ Áj æ Ás]] ¦[cāj æz ^ | ^ ÁFĒT I H \*] { É&æ Á @ , } ÁBJÁ Á / æà |^ ÁFGËEÉA / @ á Áæz ^ Á, ^ o Ás@ ÁŐUÙÁ/[cæ‡Á Ù ° o ~ { ÁJ] ^ ¦ææji } æ‡ÁTājājč { ÁÇFĒT I Í \*] { DÁj @ ¦^Ás@ ÁGE{ ^ Ásaj å Ás@ Á ^ č |æaj ¦ • Áset ¦^^Ás@æÆFJJÏÁJWGÁÜUÖÁ ¦^ č ã^{ ~ } o Áse ^ Áj, ^ o Ásað Á ásað ~ č Ásæ&cj ¦ ÉÁ

V, [Áţ, Ás@ Ás@^^Áşi åãçãã ǎ æþÁ, ^||/\*t¦[`] 引 \* • Á, ^¦^Áæà[ç^Ás@ ã Á^•] ^ &cãç^ÁT UÙÁţ 引 頁 `{ • Áţ ¦ ÁØŸ ÁG€FJÈÁV@ Á ÓFÊŹÓFFÊ£æ) å ÁÓFHÁ, ^||/\*t¦[`] 引 \* Á, æ• Áà^|[, Ás@ ÁT UÙÁţ 引 頁 `{ Áţ, -Át FÍ ÁT] { Áå` ^ Áţ Áæ) Áæ] ¦[ç^å ÁØ^à i` æ^ Á G€FHÁÓFFÁ @ dás[, } Áæ) å Á/ÕÜÙÁţ ænj c^} æ) &^Árç^} dĚÓFFÁ, 有| Á&[} cðj` ^ Áţ Áa^Áţ [} ãţ ¦^å Áţ Áş^¦ã° Á &[} cænj { ^} dĚ

#### <ck`]gʻh\Y`gmghYa`cdYfUhYX`UbX`k\UhidfYjYbhUh]jY`aU]bhYbUbWY`aYUgifYgʻkYfY`WcbXiWhYX`Xif]b[` h\Y`mYUf3`

#### <u>GiaaUfmicZCdYfUhijcbg</u>`

Ú¦^çāį \* • ÁŒÚÜ • Áå^}[ơ Áô@ ÁÙ\* { { æ³ Áţ ÁU]^¦æaāţ} • ÈĂŒ Áţ ÁΘEFJĔ&@ Á/ÕÜÙÁţ]^¦æe^• Áş ão@ÁF€Áş ^||• Á āj &|\* åāj \* Á\*āt @oÁ [čo@, ^• ơ`¦} Áa[č} åæ' Á\*¢d æa3caīţ} Áş ^||• ÁÇÓFEÁÓHEÁÓHEÁÓI EÁÓI EÁÓI EÁÓI EÁÓI EÁÓI •[č¦&^Á&{[}d[|Áş ^||• Áå[]}\*¦æåā\*} oÁţ Á5g ơ`¦āţ¦ÁU WGÁ{[č¦&^Áæo^æ ÁÇÙÔFÁæ}åÁÙÔÍ DĚA/@ Á/ÕÜÙÁæî[čoÁarÁ ]¦^•^} ơ åÁţ} Á⁄2ātč¦^ÁFCĒFEÁ

U}ÂÙ^] cr{à^¦Â ÉĞƏEFÌ ÁÕ PÖÁQ} Ás ^@oph Á; Ás@ ÁŒ{ ^ DÁ`à{ ãơ à /ás) Ár{ ang kự ÁNÙ ÔU Dáse) à AT ÚÔ DÁ^``^• cāj\*Á [ Ásiā &[ } cāj`^Á,`{ ] āj\*Ásea ÂUÔ GÁs^&aĕ•^Á; Ár¢cr}•ãç^Á; ang cr}anj & Aki á á á á á á á á á á á á á á á á •ãj &^Á; `{ ÁGEFÌ DÁ; ão @áç^¦^Áada^ & Aki / Ar¢cr}•ãç Á; ang cr}anj & Aki / Ai ang ku [ ] A •ãj &^Á; `| ÁGEFÌ DÁ; ão @áç^¦^Áada^ & Aki / Ai ang ku [ ] A •ãj & Á; ´A ang ku [ ] A ang ku [ ] A ang ku [ ] A ang ku [ ] A ang ku [ ] A ang ku [ ] A ang ku [ ] A ang ku [ ] A ang ku [ ] A •ãj & Á; ´A ang ku ang GEFÌ ÉKŪBa ang ku ang A ang ku

V@Á/ŐÜÙÁ æs Ási^•a³ } ^ a Ási a Ási a Ási } \* d\* & c\* à Á ar an de construction of the set of th

#### <u>GmghYa 'CdYfUhjcb'GdYWJZjWUhjcbg</u>'

ÚæloA, ~Ás@ Á^{ ^å^Á[¦Áŝ^^]Á';[`}å, ææ^¦ÁæeAs@ Á/ÔOEDEÚÁãe^ÁsiÁ';[`}å, ææ^¦Á^¢dæ&aā[}Á&[}•ã;da;\*Á;~ÁFÏÁ ^¢dæ&aā[}Á, ^∥•Á&[}}^&c^å/åî^ÁeA[¦&^Á;æaajÁt[Ása)ÁæaáAidā]]ā]\*Ád^ææ{ ^}o^æ&aãaĉ ÈÁV@ãrÁî•e^{{ /ásiÁsæa‡|^å/ás@ Á VÕÜÙÈÁ/@ ÁsæāiÁidā]]ā]\*Ád^ææ{ ^}o^Áæ&ājāĉÁ;æa-Áŝi^•ã}}^åÁt[Ás]&|ĭå^ká

- •Á Ø[`¦ÁxaáiÁidā]]ā;\*Á{[,^¦•ÈĂ
- •Á Ø[`¦Á,^oÁ,^||•Ás@een/Azi^Á·^åAt[Áse&&č{`|æer/Ár¢dæ&c^åAt'|[`}å,æer\/Ási^-{|^A,`{]}}\*Át[Ás@At[,^\+Át[¦Á d^æet\_^}dĚÁ

Q\Á\*^}^\add£x@`A\$j+{`^}ofsejåA^~+`^}ofs\_aee^\A{[\_\_Azee^AseeAc@Ash^aee(^}ofs,|aajofsed^Ash^a?)^åAs[Ash^A``add£A c@:\^à^A; ![çãå]\*A\$u[}c]`[`•A;]^!aeaaj}A;Ashed|A; ![&^••^•AsejåA```a]{^}cDA/@A[||[\_\_a]\*AshAshA``{ { ash^; A c@A; !å ajada^^•c^{ Ash^a}}A;ashad ^c'.•A

- •Á V@ Át¦[`}å, æchkh¢dæ&cāį}Á^•c{ Ébáj & j\*åāj\*Áv@ Áthœæ(^}c%kh?æe(^}c%kh)åÆTÏ Á/ÕÜÜÜA¢dæ&cāį}Á, ^||•ÉA , æ-Á[läfājæh]^Åå^•ã}}~åÅ[Á]![çãa^Áe&d@[lhœ&æh⁄@ ålæi jækkkæn]æ&ãc Áj ÁOÊD €€Át]{ Áea) åÁeA\* • cæaj hå/Åiæåj Å æçh¦æt A/&ænjæ&ãc Áj ÁOÉT H€Át]{ ÉA
- •Á Y ^ oÁY ^ ||ÁÚ \* { ] ÁF Ásej å ÁGÁÇY Y ÚÀF Ásej å ÁY Y ÚÀGÁ[ & æc\*å Ásj ÁY ^ oÁY ^ ||• ÁF Ásej å ÁGDÁt æj ^ ¦ Á æc\*l Ás á V[ , ^ !• Á Ásej å ÁrEÂ(^ ] ^ & œãç^| ÈÒæse@á, \* { ] Ásej å Ási, ^ ! Á@æj å |^ Á] Ást Áseát, æctā; \* { Át - ÁF ÉL Í €/ \* ] { ÈĂ
- •Á Y ^ oÁY ^ ||ÁU ~ { ] Árlázij å Á ÁÇY Y ÚÀ Házij å ÁY Y ÚÀ I Á[ & zec^å Áşi ÁY ^ oÁY ^ ||Á+Dásã & @ zec^å Áşi ^ zec^å Áşi Azec^å Áşi Azec^å Áşi Azec^å Áşi Azec^å Áşi Azec^å Áşi Azec^å Áşi Azec^å Áşi Azec^å Áşi Azec^å Áşi Azec^å Áşi Azec^å Åşi Azec^å Åşi Azec^å Åşi Azec^å Åşi Azec^å Åşi Azec^å Åşi Azec^å Åşi Azec^å Åşi Azec^å Åşi Azec^å Åşi Azec^å Azec^å Åşi Azec^å Azec^å Åşi Azec^å Åşi Azec^å Åşi Azec^å Azec^å Åşi A

V@Á/ŐÜÙÁ ærá, [åãa?aát[áæh][, Át[¦Á;, [ÁæāÁdā]]ā]\*Át[, ^¦Át/ææ(^}orábj•oræåát, Ár@át[iðralpadás^•ðralpadás^•ðralpadás^•ðralpadás\*•ðralpadás\*•ðralpadás\*•ðralpadás\*•ðralpadás\*•ðralpadás\*•ðralpadás\*•ðralpadás\*\* -{`¦ÁæāÁdā]]ā]\*Át[, ^¦Át/ææ(^}orÉ, @a&@á\*•`|oråábjáæá^å`&aāt}}át, Ár}^!\*^Á\*•^Á, @a^Áaahát, ^^cā]\*Ár@AÁÁ µ\*EŠÁ/ÔÒÁ\*~+`^}ofsa &@æ\*\*^Áātan an EXYYÚ•ÀFÁæjåÅAG¢, €ÁQ !•^][, ^¦Áæ&@a&@ababa åÁsh[, ^\÷ÁrÁæjåÅG4Ç, Á @e'!•^][, ^¦Áræ&@aÁ, ^!^Á:@orás[, }ÁæjåÁs@áçæ¢ç^•Át[Á/[, ^!•ÁrÁæjåÅG4Ç, ^!^Á&|[•^åÈADāj&^Áræ&@áOEF€ÉÅ \*![`}å, ææ^¦Á@æás^^}Á\*~^&@aç^^åÁs^ÁsæaAádā]]ā]\*Á/[, ^!•ÁrÁæjåÁA, @a^Á/[, ^!•ÁrÁæjåÁGÁ^{ æðjÁbjÁ •cæjååàÉA

 $\label{eq:constraints} V@A^ \circ c^{\{A_i\}} = A^* & A^*$ 

- •Á Tænāj cænājÁ&[}•cænjoÁ;]^¦ænāj}Á(,-ÁneļÁ\*¢dæ&cāj}}Á, ^||•ÁnejåÁnenäÁ\*dāj]āj\*Á{[,^¦•Ánea][ç^Ánc@/Á;]^¦ænāj\*Á {ājāj ~ {ĚÁ
- •Á Qáţ]^¦ææā;\*Á§,Á[č¦Áţ],^¦Áţ] å^Éξ(æā);œæā;ÁYYÚÀFÁæ);åÁYYÚÀGÁ;č] ā]\*Áæe^•Á`čæ4Áţ[Áţ¦Á|ã @q^Â æà[ç^Ás@,Á&[{àã}^å,Á;{]ā]\*Áæe^Áţ, Ás@,Á\*¢dæ8cāţ},Á,^||Áā\*|åĚÁ

•Á TænājcænājÁsi^æna(^}c%k^}c%k^Y ÚÀHÁsa)åÁY Y ÚÀIÁ, []āj\*Áæna^XA`` ædÁs[Á; ká |āt@q^Ásena][ç^Ás@aAY Y ÚÀFÁ ædjåÁY Y ÚÀGÁj`{]āj\*Áæna^ÁşāÁ;]^kænāj\*ÁşjÁ{[`¦Ás[, ^¦Á[[å^DÁ]kæna][ç^Ás@aA[{àāj^åÁj`{]ā}\*Á kana ká@Ax¢dæna];Á, ^||Áa?|åÁşāÁ;]^kænāj\*ÁşjÁç [Ás[, ^¦Á[[å^DÁ]

#### : M[&\$% `A U]bhYbUbWY`UbX`=bgdYWh]cb`5 Wh]j ]hmi

Ö`¦āj\*ÁØŸÁGEFJÉk@@Á{III[,āj\*Áşi•]^&cafi}}ák4; ængic^}ængi&Ak6afi}ák4; ængic^}ængi&Ak6afiaa?i•Ái&&`!!^åk4

<u>Ú¦^ç^}cāç^ÁT ænaj c'}ænj & ÁgÚT D</u>AÁ/@ Á^¢c'}•ãç^ÁÚT Á,¦[\*¦æqi Áseqh[], ^åÁx@ Á,]^¦æanj}+Á cæe-Áqi Ásea^}; áse áse)åÁ !^]ænaiA,¦Á^]|æ&^Á``āj{ ^}chápi Áseq:[ãn/Ásea%a:[]}cāţ ^Áæanj`!^ÈZ/@ Á,![\*¦æqi Á&[}•ã;or Á, -Á, []c@)`ÉX`æd:c'¦^ÉænjåÁ ænj}`ænhÁ, ænaj c^}ænj & Aázen \•ÈY @ }Á^``ā^åÉA':c@:¦Á^]ænaiÁ, [¦\Á, æe Á&@ å`|^åÁæao@:¦Áœenj Á, ænaiāj \* Áqi ¦Áœ?Á -ænaj`¦^Áqt Át&&`¦ÉAOEnsai![ænaiÁænj \*^Át,-Á^•c^{E]^&ãaBaA45gi -{'}{ænai}}Á, æe Á&[||^&c^åA%a`¦āj \* Ád?ïGEFJÁUT ÉZ/@asiÁ aj -{'{ ænai}}Ánsai A\*o-åáqt Ásaia^&cA; c`|^Á^]ænaiÁ, [¦\ÉÁ

<u>Ò|^&d;a8æ¢ÁQ+]^&caj}åÁ/^{]^!æč;!^ÁÙ`;ç^^</u>kÁDÉ^+¢c{ Ë; ãå^Át|^&d;a8æ¢/kj+]^&caj}åÁsj, ÅæjåÁsj, ½æ^åÁ c^{]^!æč;!^Á\*`;ç^^Á; æ•Á,^!-{;{ ^åÁs[Ásā^}ca^Â{[[+^Ás[]}^&caj}\*Ás[]}^&caj}\*Ás[{][}^}o\*ÉÅ Ô[{][}^}of;ç^!@:ææj;\*Á;~c?}Á;!^&^å^+Á\*``äj{ ^}oÁæaj`!^ÉČO|^&d;a8æ¢Ás[{][}^}o\*Ás@æ¢, ^!^Ásã^}caæ?åÁseÁ ~æajaj:\*Á; ^!^Á^]]æ&^åÉÅ

<u>X^¦ãa38æeaā}}Á;Á⁄AO[\_ÁT^ơ\¦•</u>KAOEAjæoAjæoAjæoAjæoAjčaj^ÁúTEÁy[\_Á;^ơ\¦•ÁsjÁs@Ajč{]@[č•^•Áş]^Å&[{]æ}^åÁs[{]æ}^åÁs[Á] æÁæsad[¦îËsæqá⦿z°åÁy[\_Á;^ơ\ÈÁO[[\_Áş[|č{^Aj; ^æeč\}{}oAsi^+{^}oAsi^+{^}aæč\Å&[}å\*&aāj¢}æ]&^Ajæ} o@Aj<sup>\*</sup>^ơ\¦•Áj^¦^Á&[{]æ}^åÁs[Áş^¦ãčÁs@Asi[}•ãơ}&`Aj<sup>\*</sup>Aj<sup>\*</sup>\*æč\{^}orÈAT^ơ\¦•Áy<sup>\*</sup>)åÁs[Ás^AjčAj<sup>\*</sup>A &æ¢á⦿æāj}}Áj^\?ÁA?]æsa<sup>\*</sup>åÁş[Áj<sup>\*</sup>Asæ\*àĚÅ

<u>Özaáj Á/¦æ&\āj\*Á, ÁO[[, ÁÜæe^•</u>KÁÚ\*{]@(`•^Áa) å Át^æe{ ^} ó Ásv} e^¦Á( ^c'¦Á( ^c'¦Á( ^c'¦Á( ^c'¦Á( ^c'¦Á( ^c') Å &[`'!•^Á; Ás@ Ásaáj Ásj•]^&caj }•ÈZÖæajî Á( ^c'¦Á( ^æsiāj \*•Á ^¦^Áææi )æe^åÊEsv) å Ás@ Á{[, Áæe^•Á ^ !^Á&æ4&` |æe^åA æ) å Á^çār, ^å Ási Ás@ Á;] ^!æaaj }•Á cæ-EZÖæa¦î Ási ^c &caj }Á( -Á&@ev) \* ^•Ásj Á{[, Áæe^A, æ Æ& ãaãæ4Æsj Ás@ Á ãa^} cãaãæaaj }Á( -Áæajāj \* Á``āj { ^} cEZŐ As)î Ási ^c &caj }Á( -Á{[, Áæe^A&@ev) \* ^•EA``āj { ^} cA(^] æaiÁ, æ Æc] ã&æ4î Á •&@ å` |^åÅsi ^-{ !^Áæajāj \* Á``āj { ^} cEZŐ As)î Ási ^c &caj }Á( -Á{[, Áæe^A&@ev) \* ^•EA``āj { ^} cA(^] æaiÁ, æ Æc] ã&æ4]î Á

#### 8]X'h\Y`gmghYa`cdYfUhY`UhU`fUhY`giZgWjYbhZcf'Wcad`YhY'WUdhifY3`

 $\begin{array}{l} & \left( \frac{1}{2} \right) + \left( \frac$ 

278\*`¦^ÁFCEESÁ, |[ or Ás@ Á/ÕÜÙÁsaaa‡î Áseç,^¦æt ^Á+[ , Ásæz^Á+[ { ÁU&d{ à^¦ÁFEÉGEFÌ Ás@[ \* @ÁÙ^] c^{ à^¦ÁHEÉEGEFJÁ æ) åÁ @[, •Á,] ^¦æaaţi } Ásee`[ ç^Ás@ Á;] ^¦æaaţi } æ+Á; ēj ēt ` { Á[ ¦Ás@ Á; æbţi åɛ`Á; Ás@ Ásēt ^ ÁçGJÏ Ásæê•Á; ¦Å Fà Á; Ás@ Á cēt ^DÁsj ÁdŸÁGEFJÉEGEFJĚAGE ] ^} åã;ÁPÈEA∱, |[ çãs ^ Áses åãaāţi } æ+Ásj -{ ¦{ æaāţi } Á; } Ás@ Áçæatāt ` • Ás[ , } cēt ^ • Ás@[ ` \* @[ ` \* @[ ` \* @[ ` \* @[ ` \* @[ ` \* @[ ` \* @[ ` \* @[ ` \* @] ` Á GEFJÉÁ

#### Á Ø©ÜÔŒŠÄŸÒŒÜÁG€FJÁŒÞÞ₩ŒŠÁÚÒÜØUÜTŒÞÔÒÁÜÒÚUÜVÁ

]`{]@\_`•^Á{[, Á, ^c\!•Áse^Á`•^åÁţÁs^c\!{∄,^Ác@Aset[`}oÁţÁ'![`}å, æe^!Á^¢dæ&cvåÁ'[{Áo@Aşetāt`•Á,^||Á \*'[`]•Ê55jåãçãaĭæ¥Á^¢dæ&cāt}}Á,^||•Ê5eejåÁs@At[cæ4Áset[`}o4ţÁ'![`}å, æe^!Á^¢dæ&cvåÁsĭ'!∄\*Ás@AOŸĚ4/æa|^Á FCEHÁj!^^\*}o\*}o\*Ás@A&[{à∄,^åÁ,`{]@\_`•^Et~^cv!^åÁ{[, Áç[[`{^Aç¢dæ&cāt}}Á,^||•DásejåÁs@A{[, Áç[[`{^•A {^cv!^åAsexÁşætāt`•Ácæt^•A5jÁs@At^æet\_^}o%&^}cv!Aset[}\*Á,ãc@A@atotia&cāt}/@•^A4[, Át ^cv!•Aset^Á •^åA q[Áçæt`æe^Ás@Á{[, Át, ázæt!Ás@[`\*@ks@At^æet\_^}o4]; &</br>

OE Á @, }Á,}Á/æà|^ÁFGËHÉ&@ Á/ÕÜÙÁ`&&^••~"||^Á&æ]cč¦^åÁæ)åÁst^æe^åÁæ]]¦[¢ā[æe^|^ÁJHFÊĴÎGÊH∈EA\*æ||[}•Á [-Á&[}œe{ā]æe^åÁ;æe^\¦Á+[{ÁU&q[à^\¦ÁGEFÌÁs@[`\*@ÁÙ^]c^{à^\¦ÁGEFJÁsæe^åÁţ}]\[¢ā[æe^|^ÁJHFÊĴÎGÊH∈EA\*æ||[}•Á ]`{]@[`•^Á+[],Á{^c^\+ĚZ/@ãÁş[|`{^Á&[}ç^\;orÁt[Áæ)Áæç^\¦æ\*^Á+[],Áæe^Aţ-ÁFÊÏHÁ\*]{Ê,@a&@A;^^orÁs@A ÕUÙÁ;ājā[`{Áţ-ÁFÊIIÁ\*]{ĚÁ

#### <u>Acbh\`mi:`ck 'FYdcfhg</u>'

ڬۜڝۼ۞ۿؚڔ[} د۞ۿۿ؆ؖ[} د۞٢ أمكا[, ألال ٢] [ اداهة أم ا، ٢] وا دهة أم ا، ٢] وا دهم الأم عنه أم ا، ٢ المعلى معلى المعل معلى المعلى المعلى المعلى المعلى المعلى المعلى المعلى المعلى المعلى المعلى المعلى المعلى المعلى المعلى المعلى الم معلى المعلى المعلى المعلى المعلى المعلى المعلى المعلى المعلى المعلى المعلى المعلى المعلى المعلى المعلى المعلى المعلى المعلى

#### < ck 'a i W( 'Xck b'h]a Y'cWW ffYX'Xi f]b[ 'h\ Y'mYUf3'

V@ Aši[, } Ácāţ ^Áţ ¦Áræ&@Ár¢dæ&cāţ }Á, ^||Ąţç^¦Ác@ Áœe Áãç^Á ^æe Áãţ Á¦^•^} ♂å Áş Á/æà ÅÆGË ĔOEA\* { { æ^ Ąţ -Á æç^¦æ\* ^Ási[, } Áaīţ ^Áţ ¦Ác@ Áj `{ ] @ `•^• Áæ}å Ác@ Ás' Æ { > dố& } ơ kôa (Å home Åsæe \* [ | ˆ Ấţ -Áæaŭ '| ^Ár Áş Áş ¦^•^} ♂å Áş Á Væà |^ÁFGĔ ĔOEáv@ Áz æţ ^Ás ^ æ&@ási[, } Áaīţ ^Árç^} dÉų !\* æ) ã ^å Ás@ (Å kome Åsæe \* [ | ˆ Ấţ -Áæaŭ '| ^Ár Ás Væà |^ÁFGĔ ĔOEáv@ Áz æţ ^Ás ^ e & lāj cāţ } Áz \* A kome Ås Âsê A kome Åse ^ & & a kome Ås @[ } [ |[ \* æsæ] Ê É A kome Åse Åş Á CE ] ^} å ãrÁP È EÉ V@ Áz æţ ^Ás ^ e & lāj cāţ } •Áţ !\* æ) ã ^å Ás Âse ~ & or å Áş `{ ] @ `• ^ É Kome Åse ( ^} of & or å Åş Á { æāt Áār Á, !^• ^} or å Áş ÁCE ] ^} å ãrÁP È E É

V¦^ææ{ ^}o^Kax^}c^¦Áæ)åÁ^¢dæ&caāt}Á, ^||Áa[,}Áaāt ^•Á^•č|c^åÁj¦āt æstāt^Á+[{Áæaātči/Aæ)åÁ\*čà•^čč^}oÁ^]æátÁtÁ &[{][}^}orÁstÁc@Ájč{]@{č•^•Ædx^ææ{ ^}oKax}c^¦Éæa)åÁ\*|^&da8æ4AA^¦ça8x^ÈA/@Aás[,}cāt ^ÁstÁOEFJÁ å^&¦^æe^åÁ+[{ÁOŸÁGEFÌÁÇ+;[{ÁFIÈEA4aæê•ÁstÁOŸÁGEFÌÁqtÁTÈFÁaæê•ÁstÁOŸÁGEFJDÈA/@Aás^&¦^æe^ÁstÁas[,}cāt ^Á æÁj¦āt æstāt^Kač^ÁqfA••Áas[,}cāt ^ÁstÁc@Ájč{]@{č•^Ása}åÁ\*|^&d38æ4ÁA^¦ça8x^kAæex\*;[¦ã\*•ÁQ;[,^¦Átčæ\*A•DÈÁ

#### <u>8 YgW]dh]cb'cZ8 ck b'H]a Y'7 UhY[ cf]Yg</u>'

Ú~{]@{`•^Á&[{][}^}cÁæaai`¦^•Áæ&&[`}c^åÁ{[¦Áæ}Áæç^¦æ\*^Á;-Á+ÈtÁåæê•Áå[,}Áæai^A;^¦A;\*{]@{`•^È4/@`Á {æ4p¦Áj`{]@{`•^Á^]æai•Á&æě•āj\*Áå[,}Áxā;^Á,^¦^kA

•Á Ô[{{`}}ã&æaāj}Á\$#•`^•Á&æč•āj\*Áj`{]@[`•^•Á\$[Á@c4%a[,}}Á;@}Á\*ã}æ4%a\*Á[•dĚÅ

•Á Ò|^&da&adÁa•`^•ÁQa&l`åā;\*Á;[,^¦Á;`aæ\*^•DÈÁ

•Á Ü^å`&^åÁ;¦^••`¦^Á[}^Á\$iæ&\~[[, Á;¦^ç^}c^!Át[`à|^•@{[cā;\*Áæ}åÁ^]æáiÁ§iÁ;`[cā;|^Á;`{]@{`•^•ÈÁ

V¦^ææ{^}ơ%&^}ơ`¦Á&[{][}^}ơÁæaặĩ',^•Áæð;åÁ^]æaã•Áx@ææó%&æĕ•^åÁ,`{]@Q`•^Á&[,`}Á&ā[^Á&[}•ã:ơ`åÁ;-Á\*|^&d:3&Á &@@&\Áçæqc,^Á;æa∄:ơ'}æ}&^Ê4;æ‡~`}&cā;}•Áæð;åÁ^]æãa•Ê&æð;åÁ\*|^&d:3&æ¢Á&[}d[|Á\*``ā]{^}ơÁæaặĭ¦^•Áæð;åÁ d[`à|^•@Q[cā]\*Á&[{{`}3&ææā‡}}Á≅•`^•Á∞ð;åA``à•^``^}ơÁ^]æãa•ÈÁ

V¦^æe{ ^}o^%x^}o^¦Á&[{ ][}^}o^Áæaaĭ`¦^•ÉÁ^]æaª•ÉÁæa}åÁæåbĭ•o( ^}o•Áæ&&Q[ `}o^åÁ{[¦Áæa}Áæço^¦æ\*o^Á(, ÁFÈCA%aæê•Á å[, }Áæã( ^Á,^¦Á,`{ ]@[`•^ÈÁ/@:Á(;æab)¦Ác!^æe{ ^}o%x^}o^¦Á^]æãa/&æë•ã)\*Á\*`à•œa}œãadA%a[, }Áæi(A, æeAæ)Á
Á ØQJÔQEŠÁŸÒQEJÁGEFJÁGEÞÞWQEŠÁÚÒÜØUÜTQEÞÔÒÁÜÒÚUÜVÁ

ãe \* ^ Á, ão@ÁÚ\* { ] Á Áo@ee Á, æe Á&æĕ • ðj \* Áo@ Áj\* { ] Át Át [ç^ Áse) å Ása^\* æ) Át Ásæ{ æ\* ^ Áo@ Áj æ&\ ðj \* ÈÁÚ\* { ] Át Á } ^^ å^å Át Ása^ÁA { [ç^ å Áse) å Á^ à \* ðjokt Ás[¦\^ &o Ás@e Áse \* ` ^ ÈÉÁ

$$\begin{split} \dot{O}_{AC} &= A_{A}^{A} + C_{A}^{A} &= C_{A}^{A} &= C_{A}^{A} &= A_{A}^{A} ; ¦[&^å`¦^•Áæ&&[`} ♂åÁ[¦Áŗ••Áœæ; ÁĒĒKåæ´A; Áå[, }Áā; ^Áā; ÁðŸÁGEFJĚAZ[¦Ás@A; [•A; ædŐÉÚT Á; æðÁ ]^¦-{¦{ ^åÁ; ão@; `dā; ♂¦`] @;}•Á[Ás@Ás'^æ{ ^} d^`•♂{ ĚÚT Á; |[&^å`¦^•Áæ;^Ås^•&;äa^åÅ; Ác@Á; |[b\*&A U]^¦ææ‡;}Áæ; åÁT æ‡; ♂}æ; &^AT æ; `æ‡ĚÛ`•♂{ Á; [åãã&ææ‡;}•Áæ; åÁ{[¦&^A; æ‡; ÅåãåÅ;[d‰&&[`}dA{[¦&@; A; æ‡; Åæ; Å å[, }Áæ; ^Á§AØŸÁGEFJĚĂ

Tã&^||æ}^[`•Áæ&&[`}c^åÁ[¦Áæ}Áæç^¦æ\*^Á[×Áæ]Á®æ¢Å[xá® Á[×Áå]] ^Áæ] ^Áæ] ^Áæ] ^Áæ] ÅÆ[`, }Áæ] ÅÆ[`, }Áæ] Á©EFJÈÄÖ[`, }œ] ^Áæ] &[` å^åÁæ] Ás@æ Á &æe\*\*[¦^Á] æ•Áæ••[&ææe\*åÅ;ã@Ás@AŠÕOEÔÁe\*•œ];\*Áæ] ÁÙ^] c^{ à^¦ÁGEFJĚÁ

#### KYfY'N YfY'Ubma U'cf'cdYfUnjcbU'W Ub[Yg'Xif]b['N YmYUf3'

Þ[ 🛱

#### 8]X'h\Y'gmghYa 'UW(]YjY'\mXfUi `]WWUdhifY3'

Ü^•] ^ & cāç^ Aţ, -Á&` ||^} ch = J = AU WOAU U ÖA^` ă^{ } o A@ å | æi | âk-49 + ' ^} & A = A + O = A +

#### < ck 'a i W( 'JC7 'a Ugg'k Ug'fYa cj YX'Vmih, Y'gmghYa 'UbX'\ ck ']g']hW( Ub[]b['k]h, 'h]a Y3'

OE Ásãa & ••^å Ásæi[ç^Éko@ Á√ŐÜÙÁ ¢ dæ 3c vå Ási) å Ásl^æcvå Ásij] ¦[¢ā[ææv|^À HFÊĴÎGÊH€€Á\*æk][}•A[, Á, ææv¦Ák][{Á U&{[à^¦ÁQ€FÌÁs@[`\*@ÂÙ^] cv{à^¦ÁQ€FJĚŹÓæe ^å Á;}Ás@ Á{[} c@;Ásj,+`^}o/sej å Ár,--,'`^}o/sUÔÁ&[} &^} dææt]}•Á æ) å Ás@ Á{[} c@;Á{[, Át[cæt+Áse Á{ ^æv`¦^å Åsi^Ás@ Ár¢ dæ 3cāt]}Á, ^||Á|[, Á{ ^cv'}•Éss@ Á/ÕÜÙÁ^{{[}c^å Ássát[; A FÊ €ÏÁ,[`}å•Á; -ÁXUÔ•Ák][{ÁU&{[à^¦ÁQ€FÌÁs@[`\*@ÂÙ^] cv{à^¦ÁQ€FJĚZ/@ ÁXUÔÁ; æ•Á^{{[}c^å Ássát[; A ; æ ÁrÊ FFA,[`}å•ĚY @}Á&[{] ætji\* Ás@ ÁØŸÁQ€FJÁt ÁØŸÁQ€FÌÁsija Á; æ•A^{{[}cætAssát[`}o []^¦æætj]ætÁs[, }œti^És@ Át^}åA; œtiÅsin ás@ Ásej Á; cv¦ætÁnåč &œtj}Ási, Á; æ•Á^{{[}cætÁs

V@ÁtjcædÁ,æ••Á^{ [ç^åÁārÁsæ\*^åÁt}Ác@Át,[}c@`Á/ÕÜÙÁsj+`^}cAsejåÁ\*~+`^}cAsejåÁ\*~+`^}cAsejåÁ\*[,Ác@[`\*@Á c@Át/\*æt{^}cA\*-•c\*{ÈX/@Át,[}c@`Ázet]|ð]\*ÁtjÁc@Át\*æt{^}cA\*-e\*{Aj:[çãa^+As@Ás^+cAtevAtevAtevAtevAtevAtevAtevAtevA Á Ø©ÜÔŒŠÄŸÒŒÜÁG€FJÁŒÞÞ₩ŒŠÁÚÒÜØUÜTŒÞÔÒÁÜÒÚUÜVÁ

{ æ• Á^{ [çæ†Ê&[{]æ\*^å Áţ Áx@ Áş åãçãã ǎz‡ Áx¢ dæ&cā‡} Á ^||Á æ{]]ā) \* Ê&ů ^ Áţ Áx@ Áæ\* ^¦Á, `{à^¦Á, -Á æ{]|^• Á æ) å Á&[}•ã c^}& & Áş Áx@ Á{ [} coëāţ Ё; [} coeåæj æ‡ ca3æ‡ Á^• ĭ |o• È&V@ Á},^¦&^} c&{[} d´ãa ča‡} • Á{ ¦Á\*æ&@Á, ^||Áæ\*^Á à æ• ^å Á{ } Áx@ Áxæç^¦æ\* ^Á{[、 • Áxe} å Áx@ Ár^{ ãÉæ}} ĭ æ‡ ÁxU ÔÁ^• ĭ |o• Á{[{ Áræ&@Á, ^||ĔÅ

XUÔÁæ{] |^•Á ^!^Á&[ ||^&c^åÁ^{ dĒa}} ǎdļ^Á! [{ Ác@Á/ÕÜÙÁ;] ^!ææ} \*Á¢dæ&cā‡} Á ^||•ĚY ^||•ÁÓGÁæ}åÉÅ ÓFFÉÆ¢^Á@dás[\_}}ÉÅi ŏÁ ^!^Ác^{ ][ !æðaîÁ;] ^!æc^åÁ{ !ÁT }^ÁO€EJÁæ{] |ð] \*Ě⁄æà|^ÁFCËIÁ;!^•^} orÁzÁ •`{ { æ^Â, Ác@Áæ{] |ð] \*Á^•` |orÁ{ !Ác@Á¢dæ&cā‡} Á ^||•ĚXæðãææā‡} •Á5 Á&i c\*&cā‡} Áā[ ãorÁ! { Á[ `}åÁt Ác[ `}åÁt Ác] æ^Ác@Á^•` |o4, Áçæîð] \*Á æ{] |?Åtaĩ cā‡} Á, ^!-{ !{ ^åÁt Ác@Áæ[ !æɛ[ !^Á, @ !^Átaã cā‡} •Ásc^Á^``ā^åAst Át Á c@Á@t @Á&[ }&^} dæā‡} •Át Æ{ ] |^Átaã cā‡} Á, ^!-{ !{ ^åÁt Ác@Á¢dæ&cā‡} A c@Á@t @Á&[ }&^} dæā‡} •Át Æ{ ] |^Átaã cā‡} Á, ^!-{ !{ ^åÁt Ác@Á¢dæ&cā‡} ·Á, ^||•Ást ´ā^åAst `^Át Á c@Á@t @Á&[ }&^} dæā‡} •Át Æ{ ] |^Átaã cā‡} Á, ^!-{ !{ ^åÁt Ác@Á¢dæ&cā‡} ·Á, ^||•Ást ´a‡} Å c@Á@t @Á&[ }&^} dæā‡} •Át A[ { ^Ást æt `}Ata Ast `Ac@Á¢dæ&cā‡} ·Á, ^||•Ást ´Ata Ast `^Ata Ast ``

CE[]^}åã¢Á0ĒFÁ;¦^•^}œÁ/ÔÒÁ&[}&^}dæaāj}•Áç^¦•`•Áaā]^Á\*;kaaj@A{[;Áæa&@A^¢dæa&aāj}Á,^||ÈKOĒÁ@Q;}ÊÉVÔÒÁ &[}&^}dæaāj}•Á@aç^Áå∧&{aj}A^åAşiÁræa&@Á,^||ÊÉxajàAÁ[;ÁæaA(æ)^Á,^||•Á/ÔÒÁ&[}&^}dæaāj}•Áa]^aæAájÁà^Á •cæà|^Áţ;¦Á;cāj|Áå^&{ajāj\*ÈÂUāj&^ÁØŸÁΘ€€FÊ5k@A{[||[;āj\*Á\*¢dæa&aāj}Á,^||•Á@æç,^Á@Q;}Áx@A{[[•óAáj];[ç^{ ^}oÁ Ǧ^æa\*¦Áx@aajÁ,€ÃÁ^å\*&aāj}ĎAşiÁÔÒÁ&[}&^}dæaāj}•KÁ

- •Á ÓFFÁÇ ÈLÁu\* EŠÁ§ ÁØŸÁGEEFÁ[Á[] Ëå^ c^ & a
- Á ÓF  $\in$  Áý ÈF Áu\* EŠÁ§ ÁØŸ ÁGEEF ÁĮ Á [ } Ëå^ c^ 80ÃŽ^• Ás@a) ÁF ÈE Áu\* EŠÁ§ ÁØŸ ÁGEF Ì Á Á  $\in$  Ã Á^å\* 80ÃĮ } DÁ
- •Á ÓÎÁÇCH€Áµ\*EŠÁ§IÁØŸÁGE€FÁ{IÁCÌÁµ\*EŠÁ§IÁØŸÁG€FJÁ.ÁÌĨÃÁ^å`&cā[}DÁ
- •Á Ó IÁÓÇ €€Áµ\*EŠÁB,ÁØŸÁO€€FÁE[ÁÏ Áµ\*EŠÁB,ÁØŸÁO€FJÁ.ÁÍÍà Á^å\*&cā[}DÁ
- •Á ÓÍÁÇLF€Áµ\*EŠÁ§JÁØŸÁG€€FÁ{LÁÌÌÁµ\*EŠÁ§JÁØŸÁG€FJÁ.ÁÌHà Á^å`&cā[}DÁ
- •Á ÓFÁÇFÌ€Áµ\*EŠÁ§IÁØŸÁQE€FÁ{LÁÎÏÁµ\*EŠÁ§IÁØŸÁQ€FJÁ.ÁÌHà Á^å`&cā[}DÁ
- •Á ÙÔCÁÇF€€Áµ\*EŠÁ§IÁØŸÁQ€€FÁŢIÁGÌÁµ\*EŠÁ§IÁØŸÁQ€FÌÁ.Á`GÃIÁ^å`&cā;}DÁ
- Á Ó HÁÇÌ ÈĽÁµ\* EŠŠÁB, ÁПÁGEEFÁL ÁHÈJÁµ\* EŠÁB, ÁПÁGEFJÁ. Á Í Ã Á^å` & cāļ } DÁ
- •Á ÓJÁÇFF€Áµ\* EŠÁ§JÁØŸÁG€€FÁ§LÁHEÁµ\* EŠÁ§JÁØŸÁG€FJÁ. ÁĽHà Á^åč &cã[]}DÁ
- •Á ÙÔI ÁÔ; ÈJÁµ\* EŠÁ5, ÁØŸÁGE€FÁ5; ÁGÈCÁµ\* EŠÁ5, ÁØŸÁGEFÌÁ, ÂÌÌà Á^åč &cā; }DÁÁ
- Á ÓÌ ÁÇCFÁµ\* ĐŠÁB, ÁØŸ ÁGEEFÁL Á ÈĽÁµ\* ĐŠÁB, ÁØŸ ÁGEFJÁ. ÁĽÌ à Á^å` & cāt } DÁ

U} |^Á{{`¦Á, ^||•ÁçÓŒÁÓHEÂÜÔÍÉzæ) å ÂÜÔFDÁ@æç;^Á @ , }Á(^••Ás@æ) Ázeái €Ã Á^å`&cāi }Á§iÁVÔÒÁ&[}&^}dæeái }•Á •āj &^ÁØŸÁŒEEFEÁ/@••^Ád^} å•Á^+/&cók@ Ai ç^¦æ|Áå^&dj ^Á§iÁUWCÁå^^]Á';[`}å, æc^¦AÔUÔÁ&[}&^}dæeái }•EÁQA æååãnāi }Êžæe Ásã &`••^åÁs^|[, Éko@ ¦^Á@æe Ás^^}Áseái ^&cāi }Á§iÁi ç^¦æ|Á/ÕÜÙÁ§i +`^}cók&[}&^}dæeái }•Ái ç^¦Ás@A ]¦çãi `•Á^ç^¦æ‡Á^æ+EÁ

Væà|^ÁFŒĨÁij`•dæe∿•ÉA^ç^}Á,^||•ÉKÓFÉKÓIÉKÓIÉKÓIÉKÓIÉKÓFHÉÂÙÔFÁ&;åÅUÔÍÉkô@ækáe^Á[&æevåÁ§ák@Á&^}c^¦•Á; c@Á,|`{^Á§^^Á28ĩ`¦^•ÁFŒĨÁæ;åÁ<mark>FŒ</mark>IDÉ&æ&@?ç^Áx@Á;æ\*^•Ó?æev•Á;ÁUÔÁ^{[çæ†ÉV@•^Á^ç^}Á,^||•Á q[\*^c@¦Áæ&&[`}c\*åÁ[¦Á,^æ|^ÁJÌÃÁ;Áx@ÁXUÔÁ;æ•Á^{[ç^åĚÁ

V@Á[`¦&^Á&[}d[|Á,^||•ÉÜÔFÁc@[`\*@ÜÔÍÉ&[\*^c@¦Áse&&[`}c^åÁ[¦A[ç^¦AÎGà A[-Ác@ÁXUÔÁ[æ•A^{{[ç^åÁ] ]@4^Áse&&[`}cā]\*Á{[¦Á]}|^ÁIĚà A[-Ác@Á]æe^¦Á]`{]^åÁsî^Ác@Á^•c^{EÜÔÍÉ&BJÁ]æ6a&`|æEÄ^{{[ç^åÄ]GÈTà A[-Á c@Á[cæ4ÁXUÔÁ[æ•Áse&AáAsexA[-Á];|^ÁeB]]¦[¢ā[æe^|ÂIA\*]{ÁÇEĚà A[-Ác@Á[cæ4Á]æe^¦Á]\*{]^åÁsî^Ác@Á Oāaåãāā,}æ‡Á{[`¦&^Áæc^æÁv¢dæ&cāa;}Á,^||●Áæc^Á;|æa;}^aÁ{(Áa>^Áa;•œæ|^åÁa`¦ā)\*ÁØŸÁG€G€Á{(Áa;&'~æ•^ÁXUÔÁæa)åÁ FÊËāā[¢æa}^Á{;æ•Á^{{[cæ]EÁ}

#### K\UhiXc'h\Y`cb[!hYfa'hYbXg`]b'h\Y'acb]hcf]b['kY`gʻg\ck3'

CE4, æbg ¦ãĉ Áţ -Á, ^||•Áţ } Ása) å Áţ --Á/ÔCECEUÁ ¢@ãa ãoÁs ^&! ^æe ðj \* Ás!^} å •Ábj Á/ÔÒÁ&[ } &^} d æeđį } É&bj å &&ædēj \* Ása) Á [ç^!æ|Ábī[ ] ![ç^{ ^} ô&bj Áj æe^!Á \* ædēĉ Ás[ c@Á] \* !æså ðt } óAsa) å Ás[ ] } \* !æså ðt > óAţ -Ás@ Á/ÕÜÙÈÖ` ^Áţ Ás@ Á &[ { ] |^¢ãĉ Áţ -Ás@ Á{[ `, Á^ • c^{ E&s@ad} \* ^• Æbj Á{[ `, Ásā ^ &cdī] } Áţ ç^!Ásāt ^Êbad) å Ás@ Áşæbānædīj } Æbj Ás@ { &[ { ] |^¢ãĉ Áţ -Ás@ Á{[ `, Á^ • c^{ E&s@ad} \* ^• Æbj Á{[ `, Ásā ^ &cdī] } Áţ ç^!Ásāt ^Êbad) å Ás@ Áşæbānædīj } Æbj Ás@ { &[ { ] |^¢ãĉ Áţ -Ás@ Á{[ `, Á^ • c^{ { Ebs@ad} \* ^• Æbj Á{[ `, Ásā ^ &cdī] } Áţ ç^!Ásāt ^Êbad) å Ás@ Áşæbānædīj } Æbj Ás@ { } [ ] ^!cāt• Ásæs{[ •• Ás@ Á c` å ^ Áseb ^ædÉs@ Æt^} å •Áţ æ Áş ( óA^ -{^ & SoAsaA } 3ē{ !{ { Áţ !{ Á sæ ðî ^ Aj !^ à &&cœa} |^ Aj æcx'}} ĚA

Ù^ç^¦æ‡Á,^||•Á,^¦^Á\$ña^}œãð\*åÆÿ,Á;¦^çā[`•ÁOEÚÜ•ÊÁ;¦Á,@}}Á^çãð\_jð;\*Áv@ ÁØŸÁOEFJÆsææææa>Ako@ææÁ@æç^Á āj&[}•ã c^}c4;¦Á]\_æåAsl^}啯ÿÁ/ÔÒÆ&[}&^}dæaāj}+Ás@æeÁ,æslæ)oÁ`¦c@;¦Á;à•^¦çæaāj}ÁæjåAslãa&`••ã[}KÁ

КΥ``	HfYbX`CVgYfjUhjcb`
€HŠÌ€ÎÁ	V¦^}åÁ®a^}cã&råÅ&jÁo?ŸÁGEEFÁOEÚÜÈÁVÔÒÁ&[}&^}dæaāj}●Á@æç^Árc^æåa†îÁ&r^&¦^æe^åÁ¦[{ÁrGeÉ µ*EŠÁ&jÁGEFHÁE[Á+HEÁµ*EŠÁ&jÁGEFJÈATæa5jcæa5jÁæ)}ĭæ4Áræ{] 3j*Á¦^ĭ`^}&îÁE[Á&r^c+¦{3j^/á&Ac@arÁ å[,},æåÁ&r^}åÁ&[}c3jĭ^•ÈA
€ WÌ €Î Á	V¦^}åÁsá^} cáa?aÅ5jÁOŸÁGEEFÁCEÚÜĚÄÖ¦[]]^åÁ4[{ÁrÊEEE●Á,Áµ*EŠÁ5jÁ≈a4 ^Á4[Á, ãa EÄFJJ€•ÈAVÔÒÁ •c*æåā?Áå^&k^æ^àåÁ4[{Á Ï€Áµ*EŠÁ5jÁGEEFÁ1[Á]ÎÁµ*EŠÁ5jÁGEETÉQDÁGEEÌÉQDÁOEA]ã ^åÅæa4hÌ€Á µ*EŠÉÉà`c%A[}&^}cæaā}} (A Ï€Áµ*EŠÁ5jÁGEEFÁ1[Á]µ*EŠÁ5jÅGEEEİÉQDÁOEA]ã ^åÅæa4hÌ€Á GOEEÁµ*EŠÁ3j&^ÁGEEJÁ,ão@áæaÁ][cæà ^Ác*æåā?Áå^&k^æ3;*Á4^}åÁ0;JÁµ*EŠÁ5jÁGEFÌDÉATæ5jcæ3jÁ æà}`æáÁæ4[] āj*Á4~č`^}&CÉA
€HW€JIÁ	V¦^}åÁ5āA, cāā?åÅå`¦āj*Á⁄0ŸÁGEEIÁåæææÁ^çā?, ĚÁVÔÒÁ5J&'A 2ee^åÁ'[{ÁFÏ€Áµ*EŠÁ5JÁGEEHÁt[ÁÏ€Á µ*EŠÁ5JÁGEEÍĚA/[{ÁGEEIÁt[ÁGEFHÉAVÔÒÁ3L]}&^}dæatā])•Áå^&A'∞e^åÁt[ €Áµ*EŠÁ5JÁGEFHÉA∞Á @ārd[¦&Bæa‡Á][,Á&L]}dæatā]}ĚÁQ&&'A 2ee ^åÁt[ F€Áµ*EŠÁ5JÁGEFIÉA∞Á@#@•ó4&L]}&^}deEFIÉA@ •āj&^ÁFJJÎÊÁUāJ&^Ác@}}ÁsA&'A 2ee ^åÁt[ÁH΀Áµ*EŠÁ5JÁGEEFIÁae)åÁGEEAµ*EŠÁ5JÁGEFIÈAT 2a5Jcæa5JÁ àæð}}ãæ¢Áæ{] āj*Á'A~~^}& ÁCJA¢¢A`çA}ÓA©EAEDÉA
€-TTÌ€ÎÁ	V¦^}åÁ®á^}cãa?åÅå`¦aj*Á⁄2ŸÁGEEHÁåæazæÁ^ça?,ÈÁVÔÒÁ&[}&^}dæaā[}•Áå¦[]]^åÁ¦[{Á æa]]¦[¢aījæe^ ^Á√EEAµ*EŠÁajÁ≂JÌÏË&[Á/••Ás@ayÁ≂EEAµ*EŠÁ¦[{Á≂JJHÁs@[`*@A≂JJÎÈAQÁGEHÉÁ VÔÒÁaj&¦^æe^åÁ{[ÁFÊHEEAµ*EŠÁajÁ⊂GE]Á{[Å®azaÁ@ã*GÁ2®[@A&[}&^}dæaā]}ÈÁVÔÒÁ&[}&^}dæaāj}•Á å^&¦^æe^åÁ¦[{ÂÌÌEAµ*EŠÁajÁGEE]Á{[ÁCÍEAµ*EŠÁajÁGEFÍÁa`cÁ@æçe^Áaj&¦^æe^åÁq[Á]FEAµ*EŠÁajÁ GEFJÉATæanjacæajÁæj}`ædÁæ{] aj*Á¦^``^}&CÉA
€ <del>I</del> WÏ FFÁ	V¦^}åÁ®á^}cãa?åÁ§JÁOŸÁGEEFÁOEÚÜÈÁ/ÔÒÁ&[}&^}dæaā[}●Áå^&¦^æe^åÁ¦[{Áæ}]¦[¢ã[æe* ^Á FÊEEEEÁµ*EŠÁ§JÁFJJIÁţÁÎÍÁµ*EŠÁ§JÁFJJJÁà`cÁ^à[`}å^åÁţÍÁCÍ€Áµ*EŠÁ§JÁGEEIÈÁÙ3J&^Á GEEIÉ&&[}&^}dæeā[}●Á@æç^Á <c*æåãîáå^&¦^æe^åáţíácïáµ*ešá§jágefîáæ)åá+fáµ*ešá§jágefìèá TænājcæaājÁàā?}}ãæ‡Áæ{] ð]*Á¦^``^}&amp;`ÁÇJ^¢cÁ°ç^}dÁOŸÁGEGEDÈÁ</c*æåãîáå^&¦^æe^åáţíácïáµ*ešá§jágefîáæ)åá+fáµ*ešá§jágefìèá 
€HŠÌ €JÁ	V¦^}åÁ®á^}cãa?åÁ&jÁo?ŸÁGEEEFÁOEÚÜÈÄ√ÔÒÁ&[}&^}dæaāj}●Áå^&¦^æe^^åÁ¦[{Á,ç^¦Á+ÉEEEAµ*EŠÁ¢[Á ÎÏÁµ*EŠÁ¢@[`*@ÁFJJÌÁà`cÁ^à[`}å^åÁ¢[Á,GEEAµ*EŠÁå^ÁGEEFÈÁÙāj&^ÁGEEEFÉ&Ûāj&^}d&A @æç:^Áå^&¦^æe^åÁ¢[ÁFGEAµ*EŠÁ§JÁGEEFÌÈÁTæājcæājÁàā?}}ã⇔ÁÁæ{] āj*Á¦^``^}&`ÁÇ,^¢cÁ?ç^}cÁØŸÁ GEGEDÈÁ

КΥ``	Hf YbX`CVgYfj Ul]cb`
€IWÌIHÁ	V¦^}åÁ®á^}cãa?åÁ§JÁOŸÁGEEFÁQEÚÜÈÁ/ÔÒÁ&[}&^}dæaā[}•Á,^¦^Áa^ [, ÁrÍÁµ*EŠÁ+[{Áæe^ÁrJÌ€•Á co@[`*@ÁrJJIÊ£ee]åá&o@}Á§J&i^æ^åÁq[Áa^c;^^}ÁGCÁµ*EŠÁee]åÁ+ÌÁµ*EŠÁ+[{ÁrJJÌÁc@[`*@Á GEEFÈÁQJÁGEEHÉŹVÔÒÁsi[]]^åÁs^ [, ÁrÁµ*EŠÉ£ee]åÁœeAiā]&^Ás^A;A*cæaåãiÁ§J&i^æaā CGEEÁµ*EŠÁ§JÁGEFÌÈÁ/@ãÁ,^  ÁsaÁ,^æa îÁrÁ;ã^Á+[{Ás@A/ÕÜÙÁee]åÁsaÁ,æaá∱A;@A/WFAiæe[] ā]*Á ]¦[*¦æa[LÁade+[Á^^ÁÙ^&aãa]}Á+ÉÁTæangicæangiÁsà?}}ãadA^ae[]]ā]*Á4^~~}}&AG^~¢cÁsç^}cÁOŸÁGEGEDÉÁ
€ WÌ I FÁ	V¦^}åÁ®á^}cōæðråÁ§jÁOŸÁGEEFÁQEÚÜÈÁvÔÒÁ&[}&^}dææqã}•Á,^¦^Áar^ [, Ár=EÁµ*EŠÁv@[**@ÁrJJÍÉÁ æ)åÁv@}Á§j&l^ær^åÁqíÁCIÁµ*EŠÁ§jÁGEEFEÁQJÁGEEHEÁVÔÒÁå^&l^ær^åÁqíÁ Áµ*EŠÉÅjčoA^à[*}å^åÁqíÁ FJÁµ*EŠÁ§JÁGEEÍÉÁvÔÒÁægi]^æt•Ácææàqãã^åÁæd[*}åÁGEEHEÃVÔÒÁå^&l/ærAåAqí}&^}dæeti à^ç,^^}ÁFEÁægàåACIÁµ*EŠÁ§j&^ÁGEEÍÁQFEEÁµ*EŠÁ§JÁGEFÌDÉAY^  ÆrA∱^æd ^ÁEEÍÁ(ārÁL[{ÁrÕÜÙÁ æ)åÁ®iÁjædó[[-Áx@AJWFÁæqi] ð]*Áj![*¦æqiL&懤[Ár^AÂ <mark>J^&amp;ca]}ÁrEĂ</mark> TænajcænajÁaða}}ãæµÁæqi] ð]*Á ↓^**^}&AG^A¢AÿAGEGEDEÁ
€HWÌ QCÁ	V¦^}åÁ®á^}cãa?åÅå`¦aj*Á⁄2ŸÁQEEHÁåæazæÁ^ça?,ÈÉVÔÒÁ&[}&^}dæaāj}•Á,^¦^Áa\^∥,ÁGÍÁµ*EŠÁ co@[`*@ÁFJJÌÉ&ayåá&o@}∱,^æ}^åÁxezÁHĬÍÁµ*EŠÁ\$JÁFJJJĚÓ[}&^}dæaāj}•Á@azaāj}*Áæay*^åAay*^åAayc,^^}Á IGÁxayåÁF΀Áµ*EŠÁ\[{ÁQEEÍÁ&[ÁQEFÍÁQCGÁµ*EŠÁ\$JÁQEFÌDĚAY^  ÁsaÁag]}[[¢ã]æaz^ ^ÁFÁ;ã^^Á\[{Á VÕÜÙÁxayåÁsaÁjæa⁄AjæaoAjÁá©ÁJWFÁ;æ{] äj*Áj¦[*¦æ{LÁxa≠P[Á\^^Á]^&cãaj}ÁrÉATæa3jcæa3jÁaa?}}ãaaµÁ •æ{] äj*Á\~``^}&ÂQj^¢cÁ;ç^}cÁQŸÁQEGEDĚÁ
€ <b>⊣</b> ŠÌ CGÁ	V¦^}åÁsáA, caaða áAsj Áo??ÁOEEFÁOEÚÜEÁ/ÔÒÁ&[}&^}dæaā[}Ásj & AæA a Ák][{Á, •• Áv@aðj Á Áµ* EŠÁsi ¦aj*Á ^ad}[^ÁFJJJ€•Át[Á, ç^! €EÁµ* EŠÁk][{ÁFJJJÁv@[`* @ÁOEEFEÓD[}&^}dv}dæaā]}•Á coada a Áko & AæA ~{[{ CEÁµ* EŠÁsj ÁOEEHA4[ÁFÌ €Áµ* EŠÁsj ÁOEFFÁsi oÁ^à[`}å^åA af@a^Ásj ÁOEFHA4[ÁOOEÁµ* EŠEĂ Ô[}&^}dæaā]} Ás A&A a@ ^a Á  af@a^Ásj ÁOEFFÁsi oÁ^à[`}å^åA  af@a^Ásj ÁOEFÌA4[ÁFHEÁµ* EŠEĂ @â]}ks dæaā]} & A A&A a@ ^a Á  af@a^Ásj ÁOEFĨA4[ÁFJ€Áµ* EŠÁsbj á Áset æašj Ásj ÁOEFÌA4[ÁFHEÁµ* EŠEĂY ^  Áss Á æa]] \[caā] æa^\îÁFÁ[ā^Ák][{Â/OÜÙÁsbj á Ási Á, ædo4[-Ás@AJWFÁ;æat]]a]*Á;\[*\æatukásbe][Á^^A Ù^&caī]} ÅFEAY ^  Á@as of, bacan]^Á @u, ^âÁFÊFÊFÉEB&@[]\[^co@æatj^Áse Átukásh] & AðUÔEAT æasj æasj Ásia?}}ãæpÁ •ætu]]a]*Á\~``^}& ÁQ^¢cA;ç^}óA??ÁOEOEDEÁ

Ü^çā!, Á, Á@aiq[¦a&aqÁ/ÔÒÁa) å ÁFÉE Ëå (‡, ¢aa) ^ Asianaa Andro ÓOBDEÚÁ[`} å Ás@anaka anazandin ] [¦o\* å Á[¦Á; [} ãt[¦ā] \* Á, ^||• Á €HMEFI Áa) å ÁEHŠEFI ÁC); ^ asi ÁŨ㢠ÁŨDÁ; asi Á@aç, ^ Ási^} Á; ãa&@ å Á[¦ÁadÁ, `{ à^¦Á; Á^ asi• ÈÉÓ[c@Á; ^||• Á, ^¦^Á • [`} å^ å Ása) å Ás@ Á, ^||Áa:^] cookana Ár @ása: ^ ||^ å Ása=HŠEFI + Á; ^ æe` ¦^ å Ása]] ¦[çā[ æe^||^ ÁFÎ €Á^ ofás^^] Ása) å Ás@ Á • [`} å^ å Ása) å Ás@ Á, ^||Áa:^] cookana Ár @ása: ^ ||^ å Ása=HŠEFI + Á; ^ æe` ¦^ å Ása]] ¦[çā[ æe^||^ ÁFÎ €Á^ ofás^^] Ása) å Ás@ Á • [`} å^ å Ása] å Ás@ Á, ^ ||Áa:^] cookana Ása; A ||^ á Ása=HŠEFI + Á; ^ æe` ¦^ å Ása]] ¦[çā] æe^||^ á Ása} å Ás , ^ ||Áæaà^||^ å Ása=HMEFI + Á; ^ æe` ¦^ å Ása; ] ¦[çā] æe^|^ Á+U €Á^ ofás^^] ÉA>[cãa3anaā]} Á; Ás@ Á\*\ || ¦Á; æ Á; ¦[çãa^å Ás[á c@ ÁNÙÒÚCDÉasa) å ÁT ÚÔCEása) å Ás@ Á; ^ ||• Á; ^ ¦^ Ás[ ¦|^ & A] æà^|^å ÉÁ

Ü^|ææāç^|^Á@at®ÁVÔÒÁ&[}&^}dææāt] •ÁÇ`!^æe^¦Á@ay ÁrÈE€€Aµ\*EŠDÁ, ^!^Á^] [¦ơ åÁt¦¦Á, ^||•Á⊟+W€FIÁay) åÁ €+W€JIÁa^ç, ^^}ÁrH€ÁtjĨĨÁay) åÆJJGĖŹV@ •^Áç; [Á, ^||•Áa>^Á&&\^} åÁyjÁ@A^{]] ^¦ÁW} ãaÁ+káĕ čã^¦Á Çad]] ¦[¢āt; æe^|^ÁrH€ÁtjÁrĨ €Á^^dáa^|[, Á'¦[`}åÁ`¦~æ&^DĚXOEQ`\*@Át}}[ð; œA'\j] ^¦ÁW; ãaÁ+káĕ čã^¦Á FJÌĨÁtjÁrJJGÁ,^¦āti åÉĂ, ^||ÆHŠ€FIÁQ;&\^} ^åÁaj] ¦[¢āt; æe^|^ÁHĨ€ÁtjÁrJJEÁA^dáa^(], Á'¦[`}åÁ`¦~æ&^DÁ '^][¦ơ åÁæát; æ¢ātič{Á''|ÆHŠ€FIÁQ;&\^} ^åÁaj] ¦[¢āt; æe^|^ÁHĨ€ÁtjÁrJJEÁA^dáa^(], Á'¦[`}åÁ`¦~æ&^DÁ '^][¦ơ åÁæát; æ¢ātič{Á''|ÆHŠ€FIÁQ;&\^} ^åÁaj] ¦[¢āt; æe^|^ÁHĨ€ÁtjÁrJJHÉ&@Á^OÁa\[] &^}dæatj '^][¦ơ åÁæát; æ¢ātič{Á''|ÆHÅEÅtjÅtA; 'A][} ^åÁ'[{ ÅÊE€€Áu\*EŠÁtjÁrJÈHÁu\*EŠEÂUĴ; &^AœātjÅtÅtA; 'A]] ^åÁ'[{ ÅÊE€€Áu\*EŠÁtjÁrEA; \*EŠÁtjátÁt; ÁrZÈĂUĂ; AAÔÓÁ&[} &^}dôA 'A]] '@a Á'{[} •ã ơ} d`Ár••Á@a) ÁrÈEÁu\*EŠÁ @A^ÁOÓÁ&[} &^}dôA 'A]] '@a Á'{E€Áu\*EŠÁtjátA; A@æátÁtjÁt@æáA^][¦ơ°ÅtJ] 'A

Óæe ^å Á;}Á@ Á^çã, Á;Á@ Á@á d[¦&æqA&@ { &æqA&@ { &æqA&@ { &ædA&@ædÉta Az]] ^ æb A&@ædA@@ Á, ^||Áæà ^|• Á^|æe^å Át[Á, ^||• ÁEHWEFI Á æ) å ÁEHŠEFI Á, ^¦^ Á; ã cæb ^}|^ Á;|æ&^å Ás ^ç, ^^} ÁFJJGÁzej å ÁFJJÎ Ázej å Ás@@ Á&[¦¦^•][} å āj \* ÁsæææA&[||^&c^å ÁsæA c@•^Á, ^||•Á, ^¦^ Á; æ]] ^ å Á; ãr@Áræ&@Á; c@ ¦ÈÉÓ Á; ãt&@3; \* Ásæ&b Ás@ Á§;-{¦{ æa‡}}Ás^ç, ^^} Ás@•^Á, ^||•Éb@ Á &@ { ãrd ^ ÅsæææA;[ ¦^ Á&[ }•ãrc } cAs Ás@a A@æA, ^æ Ás@ ÁUãe ÁÕ Á;[ `¦&^ÁÇ, ^||• ÁEHWEJI ÉÆHWEFI ÉÆej å ÁEHŠEFI DÉs@ Á @ tr@•cÁ/ÔÒÁsej å ÁFÉÉ Éb át ¢æ} ^Á&[ } &^} dæa‡} • Ást^Á, ~æ Ás@ Át[] Á; Ás@ Á; ær ¦Áææ] ^ Á; ãr@Ár••^¦Á &[}&^}dæaaaj}•Á,ão@Ash^]c@Ada&aska@`¦^-{|'^Á^&[{ { ^}å^åAs@aaka@`A&@ { &BaapAse}åAf`|[`}å, aaz^¦Asaaaaaaaa\*•Af[¦Á ,^||•ÁEHMEFIÁse}åAEHŠEFIÁsà^Á, aa]]^åA{[¦Ás@`Aj^¦ã[åAsa^ç\_^^}AfTJJÎÁse}åAGEFJEÁ

## الله 'Ka YXmi7 ca dcbYbh الله '; fci bXk UhYf 'Hf YUha Ybh

8 YgW]dh]cb.Á ‰;[č}å, æe∧¦Ád^æe(^}ơÁ∙ā)\*ÁseāÁ dā]]ā)\*ÈA(ÇJJÏÁJWGÁÜUÖÉA), æt^ÁHDĚÁ

DYfZcfaUbWY′GHUbXUfX′flck`Xc′mci′\_bckˈk\Yb′mciBYYXcbYŁÁ

Y@}Ác@ÁeaālÁtdāj]āj\*Ád^æe{^}oÁæa&ajāc´ÁaiÁd^æeāj\*Ájæe^¦ÁeajåA(^^cāj\*Áo@Á&|^æ)`]Á^``ā^{^}oÁajÁ/æè|^ÁFÁ [-Ác@ÁFJJÏÁJWGÄÜÜÖEĂ

=gʻh\YʻfYa YXmWcadcbYbh'VY]b[ʻ]ad`YaYbhYX3Á

Ÿ^• ĚV @^ÁœãÁ dā]]ā] \* Ád^æe{ ^} cÁæ&ājāc Á@æ•Ás^^} Á[]^¦æeā] \* Áāj&^ÁFJÌÎÈÁ

8]X'h Y'hfYUha YbhigmghYa 'a YYhih Y'hfYUha YbhifYei]fYa Ybhg']b'h Y'% - + CI & FC83'

Ÿ^• ĔQ + ĭ ^ } of the first and the first and the first and the first and the first and the first and the first and the first and first

#### K \ Uhik Ugʻi\ Yʻa UggʻcZJC7 gʻYa ]HYX`]bhcʻi\ Y`Ujf3Á

V@ ÁsaáÁ dāj]āj\*Át[,^¦•Á^{ [ç^ÁXUÔ•Á,ão@ása)Á~-3&ár}& ´Á; Ásaj]¦[¢ã[æs^|^ÁJJÈ+à ĚV@ ÁsaáÁ {ã•ã[}•Ása<sup>+</sup>^Á ^``æ¢Át[Ás@ ÁXUÔÁtæ•Á^{ [çæ¢Áæs^•Á;¦^•^}c\*åÅsjÁ/æå|^ÁFCEÊ ĚADãA {ã•ã[}•Ásaç^¦æ\*^åÁ ŘEA[[`}å•Áj^¦Á åæô Ásæ\*^åÁt}}Ás@ ÁXUÔÁtæ•Á^{ [çæ¢Áæs\*•ĚV@ Át[cæ¢ÁXUÔÁ\*{ã•ã[}•Á+[{ÁJ&d[à^¦ÁG=EÈ Ás@[`\*@Á Ù^]c\*{à^¦ÁG=EJÁ,^¦^ÁFÊ €ÏÁ,[`}å•ĚÁ

Ú^¦Ác@ÁFJJÏÁUWGÁÜUÖÉÉÖÙÖÁÀHÉÉs@Á^∙c∿{Á,ā∥Ása^Á;[åããða Ási^Á⁄ØŸG€G€Át[Á\*`à•cæ);cãæa|^Á^å\*&^ÁXUÔÁsaãÁ ^{ã •ã]}•ÈÁ

## % FYa YXm7 ca dcbYbh ['. HfYUhYX K UhYf 8 ]gW Uf [ Y

8 YgW]dh]cb. " % Jäã & @ det\*^Á; -Ád^aze^åÁ; aze^¦Á; Ád@ A; } Ë ãe^Á; aze^|Á; ã ÈÁÇFJJÏ ÁJWGÁÜUÖÉA; azt^ÁrDEÁ

#### DYfZcfaUbWY'GhUbXUfX.Á

Y@}Ás@At¦æç^|Ájān/¥iÁse&&[{{[åæeāj\*Ás@Asiã\*&@ed\*^Á¦[{Ás@Asi^æe(^}o4\^ed\{Áeg}åÁed|[]āj\*ÁsiAk[Á ¦^&@ed\*^Áj[Ás@Asi^ěčă^¦ÈÅ

#### =g'h\Y'fYa YXmWca dcbYbhVY]b[ ']a d`Ya YbhYX3Á

Ÿ^•ÈKÓæ•^åÁ;}Áşãr`æþ4;à•^¦çæaā;}Áå`¦ãj\*ÁØŸÁG€FJÉko@¦^Á;^¦^Á;[Á;[dãk^æà|^Á&@ea)\*^•Á§AÕ¦æç^|ÁÚãA ]^¦-{¦{ æ}&^ÈV@AÕ¦æç^|ÁÚãA#a Ás&&{{ { [åæaāj\*Ás@A/ÕÜÙÅåã &@ea!\*^Áse-Åå^•ã}}^åÈÄ

## %&"(`FYa YXm7ca dcbYbh, (.`=bgh]hi h]cbƯ`7cbhfc`g`

8 YgW]dh]cb. íQ•cãčcāį}æ¢&{{}d[|•ÁξÁ^•d&3có+se&~+•ÁξÁ&{}cæ{ ā}æe^åÁseččã^+•Áse}åÁ;!^ç^}oÁ\*¢][•`¦^ÁξÁ &{}cæ{ ā}æe^åÁ\*![`}å,æe^\BÁÇFJJÏÁJWGÄÜUÖÊA;æ\*^Á.DEÁ

#### DYfZcfaUbWY`GHUbXUfX`flck`Xc`mci`\_bck`k\Yb`mciBY`XcbYŁÁ

Y@}Áxa4]^&ãad,^\|/&[}•d`&aā[}Áxd^za4xd)å/xdev\}æe^Á,æe^\Á`]]|^Á@æç^Aa\^^}Á•cæa\a`@åÁxd)å/A,¦ãçæe^Á \_^||•Á§jÁ§[]æ&c^åÁxd^ze-Á@æç^Áa\^}Á^ze4^åÈĂ

#### =g'h\Y'fYa YXmWca dcbYbhVY]b[ ']a d`Ya YbhYX3Á

Ÿ^•EÁ/@`¦^Áæb^Áy[Áj¦ãçæe^Á`•^¦•Áį-Á\*¦[`}å, æe^¦Áį}Áx@`Aj¦[]^\c`Áæ)åÁy[Áj[cæaà|^Á, æe^¦Á\*`]]|^ÈÁ/@`¦^Áæb^Á āj•ãač cāį}æ‡Á&[}d[|•ÁajÁj|æ&^Áų¦Á\*č`¦^Á\*¦[`}å, æe^¦Á`•^Áæe•[&ãaæe^åÁjão@Å']&[{āj\*Áj¦[]^\c`Á ¦^å^ç^|[]{^}dĚA

#### 5 fY`UbmWY Ub[Yg`cf`UXX]HjcbU`UWHjcbg`fYei]fYX`Zcf`h]g`fYaYXmWcadcbYbH3Á

Ÿ^• EÁU}ÁQE;¦ājÁQEEÉAQEFÎEÁs@ ÁTÖP Á5a•`^å Ásaká(^{ [¦æ) å`{Á]åææ3j;\* Ás@ ÁU]^&ãæd,ÁY^||Áse) å ÁÓ[¦āj;\* Á Ô[}•d`&ca1j}ACE^∞ÁQUYÓÔOEDÁs@ezeA,[c\*å Ás@ Á^:[}āj;\* Á;~Ás@ Á/ÔOEDEÚÁæ&a1jā;č Á[¦Á;č;'^Ása^ç^|[]{ ^}o/áse) å Á `]åæz^å Ás@ ÁUYÓÔOEEás[`}åæs^Á{jás@; Ás@ ÁS@ Á\*}cā^ĉ Á;~Á/ÔOEDEÚÉAOE Á`&@É&seplÁ,^||• Áse) å Ás[¦āj;\*• Á &[}•d`&c^å Áş[k4,[åãa3rå Á;ão@3jÁs@ ÁUYÓÔOEÁ(`• o/Áa1•o/ása^ása]]¦[ç^å Ása^Ás@ ÁTÖP EÁ

## %&') FYa YXm7 ca dcbYbh; ). FYj ]Yk cZBYk HYW bc`c[ ]Yg'

8 YgW]dh]cb. ÍÜ^çā`, •Á,-Á,^, Á⇔) å Á\*{ ^!\* ð} \* Áx &@ [ |[ \* ãt • Ás@æxÁ@æç^Ás@ Á,[ c\*} aædÁt[ Á&[ • dE'~~ &aãç^^|^ Á æ&&^|^¦æe^Áa@ Áāt[ ^ +æt ^ Át[ ¦Áse ˘ã^\¦Á^• q[ ¦ææt] } ÉAÜ^çāt, • Á @æd|Ás^Á,^¦-t ¦{ ^ å Ás^ Ás@ ÁCE{ ^ Ás9} å Á^] [ ¦c\* å Á æ} } čæd|^ Ábj Ásæ&&[ ¦å æ) &^ Á, ãs@ás@ Á&[ } • ãrc\*} & Â, Í![ çãr ð] • Át Ás@ Á/ÔCEEt/Á6%20EEÁQFJJÏ ÁUWGÁÜUÖÉD, æ\* ^Á DEÁ

V@Áş ơ}ơás Áţ Ás[}•ãa^¦Á, Á², Á²&@, [|[\*ã\*•Á; Á¦ãÉ, @&@ás Á, [ơá;}Á⇔) Á ^ Á × Á &@ å '| ÈÁ/[Á@æç, Á; ^¦ãÉásÁ }^, Á?&@, [|[\*^Á; \*•Ó@æç, Á; ![{ã~Áş Á/a \* &ā; \*Ás[•oáe) å Ásā; ^Á[iÁs], ~æ) \*] ÈÁ/@, 'A; æí Ás ^ A ~æ• Á ơ&@, [ |[\*ã\*•Ás4^Ás[}•ãa^¦^åÈiQás Á?çãā; }^åÁs@ærÁseásé) ^Ásā; ^Éás) ^Áş ơ, ', • e ởa Á; æc ÁçCE{ ^ÊÁWÙÒÚŒÉáe) å Á T ÚÔCEDásæj Á \* \* \* ^ • óA, Á & &@, [ |[ \* ã\*•Á; ¦Ás[}•ãa^¦æata; }ÈiQáseá & &@, [ |[ \* î \* Ás Ást ¦ ^ å Ása; A ^ æs Á CE{ ^ÊWÙÒÚŒÉáe) å Á T ÚÔCEÉác@} Ás@ ÁCE{ ^Á; aj l A çæ; æz Ás@ Ár & @, [ |[ \* î \* ÉA/@ Ár, ç^|á, Á\*--{ ¦oÁ; ¦Á çæ; æzā; } • Á &æ) Áæ) \* ^Á'[{ Árā; ] |^Áãz ¦æt ¦^Á ^ æ&@ • Áţ Ár ¢ơ} •ãç^Át ^ æzæà ãã \* ÉÀU} Áse Áse) ` æj Ása; a Éác@ ÁCE{ ^ Á , aj Á/] [ ¦oá; } KÁ

- •Á Y @ c@ ¦Á;¦Á;[oÁa), ´Á,^, Ác & @ [ |[ \* ã Á, ^ ¦^Áãa^} cãa? å Áa) å Á&[ } ãa ^ ¦^ å Á\$[ Á@aç,^Á; ^ ¦ão/ko@acÁ ^ ad ÈÁ
- •Á V@^Á;¦[\*¦^••Á;¦Á^•`|o•Á; Á;;à;\*Á;@;æá;} •Áåč;à;\*Á;@;æá;A;à;\*Á;@;æá;A;à;\*Á;@;æá;A;à;\*Á;@;æá;A;à;\*Á;@;æá;A;à;\*A;
- •Á CB;^Á;|æ);}^åÁ;çæ);ĕæā;}•Á;[¦Á;@?Á;[||[,ā);\*Á^æ)ÈÁ

#### DYfZcfaUbWY`GHUbXUfX`flck`Xc`mci`\_bck`k\Yb`mciBY`XcbYŁÁ

Y@}Á@ÁŒ{^Á^][¦œÁţ}Ás@Ácæč•ÁţÁæ}^Á^çã\*¸•ÁţÁ4{^¦\*āj\*Áe^&@[|[\*ã+Á\$jÁs@Áæj}čæ4Á[[}ãt[¦āj\*Á ¦^][¦dĚĂ

#### =gʻh\YʻfYa YXmWca dcbYbhVY]b[ ']a d`Ya YbhYX3Á

Ÿ^• ĚÀJĴą &^ Á;@ Á;ØŸ ÁFJJÏ ÁQEÚÜĚ\$\$@ ÁQE{ ^ Á^][¦œ Áæ)}`æ||^ Át} Á\$@ Á:œæč • Át, Áæ)^ Á^çæ`, • Át, Á\*{ ^¦\* 引, \* Á c^&@[[[\* æ]• ÈĂ

- •Á Q, ÂÙ^] c^{ à^\AGEEGÊs@ÁT ÚÔCE&e) åÁWÙÒÚCE&e) }[`} &^åÅáx@^ [`|åÅs^Á&[} å`&āj\*Áxeá, æč \ædÁ æcc^} æaā] A ( æk | & ( A č å^ 4 • a) \*Ásæaà [} /ásæaā) \* ÈÁQ ÁU & ( à^\AGEEGÊs@ÁCE{ ^ /ás\a] ^ å/sæáa [| a] \*ÁsæÁÙæ^A ( ŐÁţ Á&[ ||^&cA [ ā/4] + /ác@Á č å^ ÈÁ/@Á č å^ Á^• ] o Á ^\^Aj ` à ]ã @ åÁş ÁGEEI ÈÁ
- •Á V@ÁTÚÔCE£áà^}cãa?åÁœA;cčå^Áşiç[|çāj\*Ás@Áœâåãāt]}ÁţiÁş?\*^cæà!A;tāÁţiÁt[č]å, æ\*\Åc@æAæâåãāt]\*Á { [ }ãti \^åÁœA@Apæç^Á;tāz^ÁşiÁz!a; [ ^ ]\* [ cæÊ£æeÁœÁ][ c\*}cæ2Åæ4\$ [ c\*] cæ2Åæ4\$ ( c\*) cæ2Åæ4\$ (

#### KYfY'UbmbYk 'hYW bc`c[]Yg']XYbhjZjYX'UbX'Wcbg]XYfYX'hc'\UjY'a Yf]hXi f]b[': M'&\$% 3Á

Ÿ^• ĚÁ/@^ÁFJJÏÁUWGÁÜUÖÁDÙÖÁHHÁ&[& {^} ơ ká ææ^å ÁRǐ |^ Á+FÉKOEFJÉKa&^}ca&?å Áx@ Á{[ ||[ ¸ 引 \* Á4[ ] ¦[ ç^{ ^} ơ ká

- •Á Ö^•āł}ÁæjåÁ&[}•d`&cāj}ÁţÁæjÁQEUÁd^æe{ ^}o4^^oc^{ AgtÁd^aæAsāt¢æ}AÁ![{Ás@AUãc^AÕÁ ^¢dæ&cāj}Á, ^||ÈÁÁ

#### K \ Uhi]gʻh\ Y`ghUhi gʻUbX#cfʻZjbX]b[gʻcZUbmdfYj]ci g`mi]b]hjUhYX`fYj]Yk gʻcZYa Yf[]b[`hYW bc`c[]Yg3ʻÁ

#### 5 fY`UbmbYk `fYj ]Yk g`d`UbbYX`Uhil\ ]g`li]a Y`Zcf`l\ Y`Wca ]b[ `mYUf3`

Ÿ^•ĚĂÔ¢dæ&cāį}Á,^||Áæ)åÁd^æe{^}c4^•c^{{Aŝ^•ā}}Á,|æ)•Á,ā|Aŝ^A,|^]æ/^åÁæ)åÁā;]|^{ ^} c^åĚĂ

## %&"\*`FYa YXm7ca dcbYbh; \*.'; fci bXk UhYf`Acb]hcf]b[`

#### 8 YgW]dh]cb. ĺÕ¦[`}å, æ^\¦Á;[}ãť[¦ā)\*Á;[Á;æ&\Á^{ ^å^Á,^\-{;}{ a} & bĂ;JJÏÁUWGÁÜUÖÉ,jæ\*^Á;DěÁ

#### DYfZcfaUbWY`GHUbXUfX`flck`Xc`mci`\_bck`k\Yb`mciBY`XcbYŁÁ

Y @ } ÁzdÁ^\* \* |æq[ ¦ Ázd] ] ¦ [ ç^å Á, [ } ãq[ ¦ ð] \* Á, |æ) Áše Á§, Á, |æ& Áse) å Á, [ } ãq[ ¦ ð] \* Áse ÁS[ } å \* & a

#### =g'h\Y'fYa YXmWca dcbYbhVY]b[ ']a d`Ya YbhYX3Á

Ÿ^•ĚĂT[}ãt[¦ā]\*Á\$jÁØŸÁŒEFJÁ, æsÁ&[}•ãrc/}cA; át@áx@A;FJJÏÁUWCAÜUÖĚAY æs^¦Á/ç^|Á;/æs\*¦^{ ^}or Áæ)åÁ , æs^¦Á ča‡āĉÁræ{]|^•Á, ^!^Á&[||^&c^åÁæe Árcæs^åÁ\$jÁOE]]^}åã¢ÁOEEĚA[]^}åã¢ÁOEEĚA`[}a; Á;æsÁæe Á{[||^&c^åA;Å {[}ãt[¦ā]\*Á;|a)Áæ)åÁæ)Åæ}^Ásà^çãææãi}•Áæ<A\*¢]|æãj^寧jÁOE]]^}åã¢ÁÔEEĚAT[}ãt[¦ā]\*Á;æsÁæe Á{[||[, •KÁ

#### <u>; fcibXkUh¥f</u>Á

CEpcq2 \*\* @xb@c/Á\*^}^¦æakát^}åAssea/([•cA,^||•Á;ā}&^ÁFJJJÁse]]^æsi•Át[Ása^Asi^&jā;\*Át;¦Árcæai|^Ébc@c/át[}ãt[¦ā;\*Á ,^||•Ájārc\*åAsi^|[, Á@æsiA,[cæai|^Ási}&i^æ•^•Ási,Á/ÔÒÁst[}&^}dæsiā;}Ási,ÁØŸÁGEFJKÁ

•Á €HTÌ€ÍÁÇHH€Á\*ĐŠÁŠJÁQ€FÌÁ{LÁF€Á\*ĐŠÁŠJÁQ€FJDĎÁ

V@/A§&\^æ•^A{xà•^\ç^å/Ase}åA^][\c^åA{z}\ÁEHTÌ€ÎÆaA{[c4&[}•ãa^\^åA\*ã}ãaBaa}c4,@}A&[}•ãa^\å}A&Z} F€A^as•A{x-AsaaaA(yÌ€A\*E5XA§ÁO∈F€Ase}åA+Ì€A\*E5XA§ÁO∈FÎDAsĭc4,æ\*Ase}A§&\^æ•A+[{Ác@aaaA^][\c^å/A§ÁO∈FÌDAsĭ

CఝƏ (Á, Ás@) • ^ Á, ↑ || • Á, ặ | Á&[, } cā) ǎ ^ Á&[, Áà)^ Á, [ } ão[ ¦^å/Áse) å Á, [ Áǎ ¦ c@ ¦ Á æ{, ] |ā) \* Áà^^ [ } å Ás@ Á &@ å` |^å/Ávç^} or Áār Á } ^ &^ • • æʿ ÁsæÁc@á Ásā; ^ ÈÁ

OE Á,[c^åÁ^æl|ð^\ÉÉan/áa Á^&[{ { ^} å^åÁs@eenÁc@Á&@ { 38æ4Áæ) åÁ'\[`}å, æc^\Ásæææàæe ^•Á[¦Á, ^||•Á⊟HMEFIÁæ) åÁ ∉HŠ€FIÁs^Á, æ]]^åÁ[¦Ás@ Á,^¦ā[åÁs^ç ^^} ÁFJJÎÁæ) åÁG€FJĚÁ

#### $\dot{O} \cdot a \tilde{a} = a e^{\dot{a} \dot{A}} \hat{O} \dot{O} \dot{A} \tilde{U} [ \dot{A} f \tilde{a} a c \bar{a} \dot{A}$

 $\begin{array}{l} \textbf{Ce} \dot{\textbf{Ash}} \bullet^{*} | d \widehat{\textbf{Zb}} @ \dot{\textbf{A}} O \dot{\textbf{O}} \dot{\textbf{A}} |^{*} \{ \land \dot{\textbf{A}} \ a a code \dot{\textbf{A}} a d d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d \| \dot{\textbf{A}} a d$ 

Óæ∍^åÁ;}Á∞;•^Á&[}q[`¦•Ébs@Á>•cā[æer^åÁ;ãa:c@Á;-Ás@A\*[`¦&^Áæ}^æÁ/ÔÒÁ;|`{^Á@æ•Áå^&¦^æ•^åÁ æ]]¦[¢ā[æer\^ÁFïĨĂÁ;[{ÁHÊ €€Á^^cÁ;[ÁHÊ€€€Á^^cÁ;¦Áæ]]¦[¢ā[æer\^ÂHÃÁ;As@ÁØŸÁΘ€€FÁ;ãa:c@Á08&8[¦åā]\*Á d[Ás@Á/ÕÜÙÁJÙÉA,ç^¦æa|Á/ÕÜÙÁ;]^¦ææa]\*Á\*[æa+Á,ā|Ásh^Á^çār,^åÁsāÁs@Á[`¦&^Áæz^æ4,|`{^Á,āas@á,@a]\+Át[Á ÏÍÃÁ,Ás@ÁØŸÁGEEFÁ,āas@ÆA,¦ÁGETEEEÁ^^dĚADEÁs@Ás[`}åæa^ÊEs@Á/ÔÒÁ,|`{^Á,æ}¦[,ā]\*ÁsaÁ[['\A,'|[}[`}&^åEA @æçā]\*Ásh^&¦^æe^åÁsa]]¦[¢āt]æe^|^ÁGIÃÁ¦[{ÁÉEEEÁ^^dát[Á=EEÉÁ^^dÉA,@B&@Á^]¦^•^}orÁsa;Ása]]¦[¢āt]æe^|^Á ÏÎÃÁsh^&!^æ^Á¦[{Ás@ÁØŸÁGEEFÁ,ãas@ĚÁ

V@ÁOE{ ^Á@ze Á&[{]|^c^åÁs@ Á\$jç^•cãtaæa‡i}Á; ~Ás@ ÁÙãc^ÁÖÉÉŐÁse)åÁQát[ĭ¦&^Áse^^ze Áse)åÁ@ze Á;¦[][•^åÁ§•cæa|j3\*Á ĭ]Át[Áāç^Ár¢dæa&qa‡i}Á; ^||•ÁsjÁs@•^Á[ĭ¦&^Áse^^ze Á; @3&@ÁsrÁr¢]^&cråÁt[Árāt}ãa3&ze)d^Ásj&¦^ze ^Á{; ze •Á^{ [çæ4Á ze)åÁse&&^|^¦æz^Ás@ Á:@3]\3j\*Át; ~Ás@Á/ÔÒÁj|ĭ{ ^ĚÁ

#### HfYUha YbhiGmghYa Á

V@Á/ŐÜÙÁ:l^æet{^}ơ4(^•ơ{{Ás},+`^}o4oe)åÁ?~+`^}ơ∮æ•Áæt{]|^åÁ;[}ơ4¢´Ás`¦ā)\*Á9ŸÁGEEFJÁsjÁse&&2[¦åæ)&^Á jãr@Á@ÁØŸÁGEEFJÁ ÁØŸÁGEGHÁ;[}ãt[¦ā)\*Á;|æ)ĚŽŐ¦[`}å,jæe^¦Áræt{]|^•Á;[{ Ás@Á∿¢dæ&ati}}Á; ^||•Á, ^¦^Á &{||^&c^åÁsjÁÖ^&^{{ à^}}ÁGEFÌÁse)åÁr?}^ÁGEEFJÁsjÁse&&{[¦åæ)&^Á;ãr@Ás@ÁØŸÁGEEFJÁ,Á9ŸÁGEGHÁ;[}ãt[¦ã)\*Á;|æ)ÈÁ

### =gʻh\YfY`UXX]h]cbU`acb]hcf]b[`dfcdcgYX`df]cf`hc`h\Y`bYI hfYdcfh8Á

Þ[Ásæååãāā]}æļÁ,[}ãā[¦ā]\*Á[¦ÁØŸÁGEFJÁsiÁ]¦[][•^åÁsh^[}åÅ,@æe/#siÁ]¦^•^}&°åÁsiÁ@?ÁT[}ãā[¦ā]\*ÁÚ|æ)Á (CE]]^}åãrÁCHDÁ,-Ás@ÁØŸÁGEFJÁGEÚÜÈÁ/æà|^ÁFCËJÁæ)åÅCE]]^}åãrÁCE[]^}åärÁCEÁ,-Ás@áA^][¦AÁ;¦[çãå^•Ás@ÁØŸÁGEFJÁ,ÁØŸÁ CECHÁ,[}ãā[¦ā]\*Á]|æ)ÈÁU}&^Á,^,Áv¢dæ&aā]}Á,^||•Áseh^Ási•cæ||^åÁsič¦ā]\*ÁØŸÁGEGEÉÉs@}Ás@^Á,ā]|ÁshÁ,[}ãā[¦^åÁ &[}•ã:c}AÁ,ão@ásejÁse]]¦[ç^åÁ,[¦\Á]|æ)ÈÁ

## %&"+` Cj YfU``F Ya YXmZcf'8 YYd'; fci bXk UhYf`

#### 8]X'h Y'H; FG'a YYhih Y'fYei]fYa YbhgʻcZh Y'%-+'CI & FC83Á

Ÿ^∙ È∰

- •Á P^妿ĕ |ã&k&{{} cæaj { ^} c⁄aj ÁW}ão Árkáæ) åÁ Á\*¢c^}å•Á]\*¦æåå? o⁄s ãr@ãj ÁUWGÁa^^[}åÁc@Á Áµ\* EŠÁ&{} q[` ¦ÊÁ { ^^cāj \* Ác@ÁxUÔÁ&¦ãc^\aj Aj Ác@ÁFLJÏ ÁUWGÁÜDÜÁ
- •Á V@ Áţ cæd, Áœç^¦æt^Ár¢dæ&cāţ} Á, ^||Á, æc^¦Áj`{]^åÁr¢&^^å^åA/[cæd, Û^•c^{ AJ]^!æcāţ} æd, AçFĒlĺÁ \*]{DÈV@ ÁQŸ ÁQEFÌ Áæg}`ad, Áœç^¦æt^Ár¢dæ&cāţ} Á Áæc^Á, ærÁFĒ ÏÎ ÁT]{ÈÁ
- •Á V@ Á/ŐÜÙÁ¢dæ&c°åÁæjåÁdAæc°åÁdHFÊĴGÊHEEA\*æq|[}•Á;-Á;æc°¦ÁæjåÁA^{ [ç^åÁFÊÉ€ĬÁ;[`}å•Á;-ÁXUÔ•Á ~{[{ÂU&d[à^¦ÁGEFÌÁq[ÂU^]c^{à^¦ÁGEFJĚACç^¦æ\*^ÁXUÔÁāj,-{`A}c%a[}&^}dæqā]}•Áå^&d^æ^åÁà^ÂĹÈÃÁ ~{[{ÂOŸÁGEFÌĚA
- •Á Ò~+į`^}ơÁ(UÔÁ&[}&^}cæāį}•Á,^¦^Áa^|[,ÁÔUÔĖ]^&ãã&Á^``ã^{ ^} o·Á{¦Áæ|Á;æ{]|ã,\*Á°ç^}o·ÈÁ

8 c 'UbmUXX]h]cbU'a YUgi fYg'bYYX'hc'VY'UXXfYggYX3''

 $\mathbb{C} \bullet \hat{A} (\eqref{action} a \hat{A}_{a} | ^ c \tilde{a} ) + \hat{E} (\eqref{action} a \hat{A} ) + \hat{E}$ 

- •Á Ö^•ā\*}Áæ}åÁ&[}•d`&dą}ÁQEUÁd^æe(^}oÁ^•c^{ Ag Ád~azAFÊ Áåāj¢æ}^Á\[{Áx@AÛãc^AÕÁ¢dæ&dą}}Á \_^\||ĚÁÁ

## %&", ` Ch Yf F Y UhYX 5 Wjj ]hmjb : M & % `

Q ÁGEFJÉA [}ãt[¦ā]\*Á,^||•Á,'[][•^åÁt[¦Á æt]]å]\*Ásj Ás@ ÁØŸÁGEFJÁT[}ãt[¦ā]\*ÁJ|æsj Á,^'^Á æt]]^åÁt[¦ÁFÉ ËÁ åãt ¢æsj^ÈVæsh/^ÁFGËF€A,'!^•^}o Ás@ Á^•`|o•Á, Ás@ ÁFÉ Ëáāt ¢æsj^Á æt]]å]\*Át[¦Ás@ Á/ŐÜÙÁsj+ĭ^}dÉs-+ĭ^}dÉsesj åÁ ^¢dæskati]}Á,^||•Éb>[ÁØ^å^¦ætÁT ÔŠÁ@æe Ás^} Á•œælja® @ åÁt[¦ÁFÉ Ëáāt ¢æsj^Lá@; Aç^¦És@ ÁT ÖP Á@æe Á ^•œælja® @ åÁsej ÁPÜŠÁşætĭ^Át; ÁFÈEÁµ\*EŠÉACE[|Á][&ææta]}•Áæt]]^åÁ\*¢&^]oÁ\*¢dæskati]}Á,^||•ÁÓGÁsej åÁÓFFÁ@æåÁFÉÉ Ë åãt ¢æsj^Ást[}&^}dæstaj}+Áv¢&^^åāj\*Ás@ ÁPÜŠÉV@ Á/ŐÜÙÁsj+ĭ^}oÁsej åÁ\*-+ĭ^}oÁ;^!^A, A[]\*ÁÓGAsej åÁÓFFÁ@æåÁFÉÉ Ë åãt ¢æsj^Ást[}&^}dØEFJÉÄÜ^•ĭ]orÁt[{ Á;!^çãti •Á^æsi•Ásj åã&æætåák@ææÆÉÉ Ëåāt ¢æsj^Ástai}}A,'ač&ati]}A,'ač&ati]} ¢át ¢æsj^Ástaj Ásj, Ašj, Ašj, Ašj, Ašej åÅ\*-+jč^}oÁ;æti]]^•Éstaj åã&æætåák@ææÆÉÉ Ëåāt ¢æsj^Ástai}}A,'ač&ati}}A,'ač&ati}A,'ač ¢át ¢æj^Ástaj Ásj, Ašj, Ašj, Ašj, Ašej åÅ\*-+jč^}oÁ;æti]]^•Éstaj åã&æætåák@ææÆÉÉË Ëåāt ¢æsj^Ástai}}A,'ač ¢át ¢æj^Ástaj Ásj, Ašj, Ašj, Ašj, Ašestaj \*Á?; ¢át čæj/Ástaj Ásj, Ašj, Ašj, Ašej åÅ\*-+jč^}oÁ;æti]]^•Éstaj åã&æætåásæætj \*Á;[Ást[}&^}dcastaj}A,'ač §átá ætj] Ástaj ÁsoA

V@Á,[}ãt[¦ā]\*Á,^||Áæ;]|ā]\*Á^•`|œÁæ^Á,¦^•^}@åÁ;}Á/æà|^ÁFCËFFÈKOEA, æb;lãĉÁ,-Áo@Á;[}ãt[¦ā]\*Á,^||•Á •æ;]|^åÁÇF€A,-ÁFÎDÁ@æåÁFÊËãā;¢æ}^Á&[}&^}dæaā;)•Á¢&^^åā;\*Á©ÆÜŠÊÄ, ão@áo@Á@ã@o~Á&[}&^}dæaā;)•Á -{`}åÁ§JÁs@Áæ;]|^•ÁæÆHTÌ€ÎÁÇFÎÈHÁµ\*EŠDÁæ;åÁÚRÀÌ€ÎÁÇFIÈSAµ\*EŠDĚA2ã`¦^ÁFCÉÍÁ;@, •Ás@ÁFÊËãā;¢æ;)^Á &[}&^}dæaā;}•Á§JÁ;|æ;Áşã^,Á{¦Á@Á,^•¢A,[¦aā;}Á;ÁUWCĚÁ

Á

## 13Á CD9F56 @9'I B+H''.'899D'; FCI B8K5H9F'

V@ÁÚÕÜÙÁa^\*æjÁ[]^¦ææj\*Á;}ÁT æâÁÉÉFJJIÈQAFJJËÉQAFJJËÉQAÁDÕÜÙÁgi+"^}œ%i[]]^åÁa^|[, Á@AFJJGÁUWHÁ ÜUÖÁ^``ā^åÁajār A[¦ÁæļÁXUÔ•ÈQAÖ^&^{à^¦ÁFJJJÊX}å^!Áæ}Åæi\^{{^}} ]]]\*áÅæ^Á;æA^å`&^åÁi[{ Áæ∮AČO\*&^{{^}}A^{{^}}AFÊEEEA]}{ÁţAA\*A^{{^}}A\*ÊEEEA]}{ÁţAA\*A^{{^}}} ]]]\*áÅæ^Á;æA^å`&^åÁ'[{ Áæ∮A[{ Áæ∮A[{ Áæ∱A[{ Áæ∱A\*\* ]^{{^}}}A\*EEEA]}{ÁţA\*A\*\* ]\*{]]]\*ÉQQÁ&[}&^}dæaj}Á,^!^ÁœA\*A\*\* ]\*{]]]\*ÉQQÁ&[}&^}dæaj}Á,^!^ÁœA\*A\*\* ]\*{]]]\*ÉQQÁ&[}&^}dæaj}Á,^\*A\*A\*\* ]\*{]]]\*ÉQQÁ&[}B\*}dæaj}Á, ]\*{]] \* []]\* ] \* A\*A\*\*

## % '%FYa YXm7 ca dcbYbh, % A cb]hcfYX BUhi fU 5 hhybi Uhjcb

8 YgW]dh]cb. ˈ‰[}ãt[¦^åÁjæči¦æ∮Áæec^}čæãi]}ĚÁÇUWHÁÜUÖÁQE[^}å{ ^}å{ ^}eÁFÁÇ⊒€€ÊDÉAjæč^^ÄFÄÇZ€€ÊDÉAjæč^ÁFÏDÉA

#### DYfZcfaUbWY'GHUbXUfX'flck'Xc'mci'\_bck'k\Yb'mciBY'XcbYŁÁ

Y@}ÁxaÁ([}ãð[¦ã)\*Á,¦[\*¦æ‡(ÁšarÁ\*•cæà)ã:@`åÁsa)åÁ([}ãð[¦ã)\*Áša/Ás)Á&[{]|ãæ)&^Á, ão@ko@Á^\*`|æe[¦Ása]]¦[ç^åÁ OE;}`æ‡ÁT[}ãð['Å]\*ÁÚ|æ)ÈĂ

#### =gʻh\YʻfYa YXmWca dcbYbhVY]b[ `]a d`Ya YbhYX3Á

Ÿ^•EĂQĘ]^}åã¢/QEÁ\*`{{ ælā ^•Áx@AØŸÁQEFJÁ;[}ãt[¦ā]\*Á;|æ)Áæ)åÁæ)^Á&^çãææã[}•Áæ^A\*¢]|æ39,^åÁ§JÁ QĘ]^}åã¢AÔÈEĚЮ^œã‡•Á;~Áx@A\*![`}å, æe^!Á;[}ãt[¦ā]\*Á;![\*¦æ;Áæ^A&ãã&&\*•^åÆjÁÛ^&cã;}AFHÈEĚÁ

## % "& FYa YXm7 ca dcbYbh &; fci bXk UhYf A cb]hcf]b[ `

8 YgW]dh]cb.∰、‰[}ãī[¦ā]\*Á; Ás@Á\*¦[`}å, æe^¦Á{¦ÁXUÔ•Át[Áç^¦ã²Ás@Á~^&cãç^}^••Á; Ás@Á^|^&c^åÁ ¦^{ ^å^Ása}åÁs@Á;æe\*¦æ4Áseec^}čæeāį}Á; Ás@ÁÙ[čo@ÁÚ|`{ ^ÈAQUWHÁÜUÖÁOE[^}å{ ^}å{ ^}oáQƏ€€ÎDÉA; æt\*^ÁFÏDÉA

#### DYfZcfaUbWY'GHUbXUfX'flck'Xc'mci'\_bck'k\Yb'mciBY'XcbYŁÁ

Y@}ÁæÁ([}ãt[¦ā]\*Á)¦[\*¦æ;(ÁārÁ•cæà)ãr@åÉæb)åÁ([}ãt[¦ā]\*ÁārÁb)Á&[{]|ãæ)-&^Á,ão@ko@Á^\*`|æ;[¦Áæ]]¦[ç^åÁ OE;}`æ4ÁT[}ãt[¦ā]\*ÁÚ|æ)-ÈÁ

#### =gʻh\YʻfYa YXmWca dcbYbhVY]b[ `]a d`Ya YbhYX3Á

Ÿ^• ĚKŪĘ]^}åã¢/KDÉ+`{{ ælā ^• Áx@ Á⁄ØŸÁOEFJÁ;[}ãt[¦ā]\*Á;|æ)Áæ)åÁæ)^Á&^çãæaā[}• Áæ\^Á\*¢]|æa)^åÁ§jÁ CE[]^}åã¢ÁÔÈEÈÁ

Õ¦[`}å, æc^\A`æ{]|^•A, ^\^A&[||^&c^àA`{[{ Aç [ÂUWHĂ, ^||•Aş ÁOŸÁOEFJÁse Á, æd A, AUWFÉAUWEÉA9 å ÁUWHÁ æ)}`æḥÁ æ{]|ā]\*ÉAUæ{]|^•A, ^\^A&[||^&c^àA éxe Á]^&ãæð å Aş Áo@ Á([}ãt['ā]\*Á, |æ) Áse) å Áse) æ^`: ^åA['AXUÔ•Áse) å FÊE Ëåā[¢æ) ^ÁseaÁ[&ææā]}•A @[, }Á;}Á201``\^ÁFHËEÈV@ Á]^&ãã&Aş Áse}Á,``\][•^A, Á([}ãt['ā]\*Á>æ&@Á, ^||Ás Á, \[çãa^àÁ ā)ÁOE]]^}åãcÁOEÈÕ\[`}å, æc^\A`|^çæaā]}•Á, ^\^Áse[A['Aæ``\^åAs`']ā\*Ás@A, [] ãt['ā]\*Á>c^}cóse) å Áse^A ]\^•^}c°åAş ÁOE

#### K\Uhik YfY'h\Y'fYgi`hg'cZh\Y`GhUh]gh]WU`5bU`mgYg3Á

V@ÁTæ)}ËS^}åæ|Ácææāca&ækæ)æf•ācÁœeÁ@ac[¦&&æ|^&a^>}Á&[{]|^c∿åÁ[¦&r^}Åå\*^Ë[-Ë]|`{^Áæ)åÁ&>}c^¦Ë [-Ë]|`{^Á, ^||•ĚQAØŸÁOEFJÁ;}|^Á, ^||ÁEHTÌIÌÁ, æÁæ{[]|^åÅã@3já@e&r}Áå\*^Ë[-Ë]|`{^Áæ)å&r>, c'¦Ë -Ë ]|`{^Á, ^||•ÉQÆ`{{æ^Â\_cœaāca&ækæ}æf\*•^•Á, æÁæ{]|^åÅã@3já@e&r}É ]|`{^Á, ^||•Á, ^|,^É & a^à^åÁ, ão@áØŸÁOEFÌÁ^•`|orÁ{¦Áæ)Á;ç^¦çã`, Á;ÁœAáæ^Áæ}åÆaAj¦^•^};c\*à@á @^o&æ}åÁ;¦a}@áj¦^•^}c3; & AœATæ} ES^}åæ|&r>oA(^`Tæ}ES^}

V@Át/}åÁt[¦ÁEHTÌIÌÈÉ,@3&@Á@eæÁ@árd[¦3&e#|^Áa/^}Á©Á&/}c\*¦Á(-Áx@ÁU[`c@ÁU|`{ ^É&&@a)\*^åÁ{[{ Á,[Át/}åÁ [¦Árcæà|^Át[Áå/&'/æraj]\*Áærá&[}&/}c#aeáj})•Á@eç/Åå/&'/ær^åÁtç/!Áx@ÁæroÁãç/Áræt]]jaj\*Árç/}orÈA/@Á/ÔÒÁ &[}&/}dæaāj}•ÁseaÆHTÌIÌÀÆæç/Á.c%æåjä^Åå/&'/ær^åÁ'[{ ÁrÊt €€Áu\*EŠÁÇØŸÁFJJĴDÁt[Á,€€Áu\*EŠÁÇØŸÁFJJ]DÁt[Á &[}&/\*EŠÁÇØŸÁG€€HDÁt[Ás@Á&`¦/^}c&]}&/}dæaāj}Át\_Ár€€Áu\*EŠÁÇØŸÁFJJĴDÁt[Á,&^}c¢] å^c%&aāj}•Át\_Áå/\*¦æåæaāj}Á,¦[å`&orÁær•[&ãæe\*åÁ;ãa@ÁrÊtÊtÊtä&Q0[¦[^c@a)AÁg2ètÊárÊtÊtä&&Q1['[^c@a)AĎæaÁ €HTÌIÌÊX(æÁbjå&3æe\*Ás@ex6x@ÁP[¦c@ÁU]{ { ^ÆrAj[cÁ;]°Áa/\*äj}j\*Át[Á; ]\*|^Á;ã@ás@AÛ[`c@ÁU]`{ ^ÁsæÁs@Á  $\begin{aligned} & UWFEUWHAS[`} as a fas of, as fas fighthat for the second degree for the second deg$ 

#### 5 fY Webhjb[YbWmUWfjebg k UffUbhYX3Á

Þ[ĚÁ/@ ÁJWHÁÜUÖÁCĘ ^}å{ ^}cÂkFÁÇƏƏEÎDÁ^˘˘ã^•Á&[}cāj\*^}&`Áæ&cāt}•Át[Á&^Á&[}•ãa^¦^åÁ,@}Á@ ÁTæ}}Ë S^}忇|Árcææārcā&æ‡Áæ}æf`•ãrÁ@(、\*Ác@æcÁæ4,^||ÁæeÁ@ Á\*å\*^Át-Á@ ÁÙ[čc@ÁÚ|č{^Á@ærÁæ}Ásb;&\^ærāj\*Át^}åÈÁ/@ Á 、^||•Áæ}æf:^åÁsb;ÁØŸÁGEFJÁ;@(、^åÁseÁsa^&t^ærāj\*Át^}åĚÁ

#### K\Uhi[fcibXkUhYf'acb]hcf]b[`]g'dfcdcgYX'VYZcfY'h\Y'bYIhfYdcfh8Á

Ùāj&^Ác@ ÁFÉE Ëåā[¢æ)^Áãs•`^Á5jÁØŸÁGEFÍÉA:æ{]|ðj\*Á@æe Ás\^}Á&[}å`&c^åÁ5j&|`åāj\*ÁFÉ Ëåā[¢æ)^ĚAØŸÁGEGEÁ ,āļ|Á&[}cāj`^Á;[]ãt[¦ðj\*Á;[¦ÁFÉE Ëåā[¢æ)^ĚA/@/Á,¦[][•^åÁUWHÁ;[}ãt[¦ðj\*Á^``ã^{{ ^} or Áse\^Á;¦^•^}c\*åÁ5jÁ Væà|^ÁFHÉHÁse)åÁGE]]^}åãçÁCEÉÁ

## % " ` F Ya YXm7 ca dcbYbh [ ' . `8 f]``]b[ `5 Xj ]gcf]Yg`

8 YgW]dh]cb. %û[}cā) č^åÁā[]|^{^} œaā[}Á[.-Ás@ Áå¦ā]]ā) \* Ásaåçã=[¦āt•Ás@æxÁ^\*č|æet•Á@ Á§j•cæe|æaā[}Á[.-Á,^\_ Á ]¦ājæet^Á, ^||•Á, ãc@aj,ÁUWHÁse ÁsaÁU]^&ãæe‡ÁY ^||ÁÔ[}•dč &cā[}ÁCE!^æÈHÁÇUWHÁÜUÖÁCE[^}å{ ^}å{ ^}cAÈFÁÇC⊖∈ÊDÉÄ ]æt\*ÁFĨDĚĂ

#### DYfZcfaUbWY`GhUbXUfX`flck`Xc`mci`\_bck`k\Yb`mciBY`XcbYŁÁ

Y@^}Áæ)ÁÙYÔOEÁOEåçã[¦^ÁãrÁãr•`^åĚÁ

#### < Ugʻh\Y`A 8 < `]ggiYX`U`GdYW]U`KY``7 cbghfiWH]cb`5 fYU'5 Xj]gcfm8Á

Ÿ^•Ê£9,ÁR\*}^ÁFJJÎÈKQ,ÁR\*}^ÁFJJJÊ£çãæká@ÁTÖPÁx@ÁÙYÔŒ£a[`}åæł^Ár¢c^}å^åÁ{[`c@,^•ó49,&|`åð;\*Áx@Á Tā•ā•ā]]ãŰlãç^¦Áx9;åÁTæ•@æ‡|Á0Eç^}`^Át[Á\*}•`¦^Á;|`{^Á&[ç^¦æ\*^È?/@ÁUYÔŒ&x4#[Á&[ç^¦•ÁUWHÁx9;åÁx4|Á;Á UWGÁxæ-Á;Á0E‡¦ã;Á0EEFÎÊA;ão@k@Á&`¦¦^}óAs[`}åæ?Á@(;}Á;}Á©ã\*`¦^ÁOËFÁÇE‡]]^}åã¢ÁÖDĚÁ

#### 5fY`UbmiW(Ub[Yg`cf`UXX]h]cbU`UWF]cbg`fYei]fYX`Zcf`h]g`fYaYXmWcadcbYbh8Á

Þ[ Ă

## % "( ` Cj YfU``F Ya YXmZcf 'CI ' `

=gʻh\Y`FYaYXmʻZcf`CI'`CdYfUhjb[`]bʻ7cad`]UbWY`k]h\`h\Y`%-&`CI'`FC8`UbX`CI'`FC8` 5 aYbXaYbh'į%fB\$\$\$\*Ł3Á

Ÿ^•ÈKQ ÁØŸÁQ∈FJÉK ¦[`}å, æc∿¦Á;[}ã[¦ā]\*Á{[\Á]æ&∧áserÁ;¦^•&¦ãa∧åAşiÁc@ÁQE;}`æ¢ÁT[}ã[¦ā]\*Á(|æ)ÈA/@∧Á æ}}`æ¢Á\*æ{]|ā]\*Á[`}åÁ;-ÁØŸÁQ€FJÁşiå&3ææ∿•Ás@æcAs@ÁÙ[`c@ÁÚ|`{^Á{[[d]¦ā]cÁse]]^æ•Á{[Ása^Ása^&}^æā]\*Á;¦Á æcÁ^æ•cÁrcæsi|^ÉA;ão@áscÁrcæsi|^Á{[Ása^&:^æā]\*Ás!^}åÅsæAs@Á&^}c∿¦Á;-Ás@A;|`{^EA

#### 5 fY'UbmWYUb[Yg'cf'UXX]h]cbU'UWF]cbg'fYei]fYX'Zcf'Cl'3Á

Þ[ĔÞp[Ásæååãāā]}æÁsæ&cā]}•Áse^Á,^&^••æ^Ás^&æě•^Á,[Ás]&\^æð]\*Á\^}å•ÁseÁ@Á\*^Á,[Ás]&\^æð]\*Á\^}å•ÁseÁ@Á\*^Á, Ás@Á,|`{ ^Á, ^\^Á ãe^}cāð\*åÁs^Ás@Á cææã cã&æÆ; æf •ã EÁ Á ØQUÔQEŠÁŸÒQEÜÁGEFJÁQEÞÞWQEŠÁÚÒÜØUÜT QEÞÔÒÁÜÒÚUÜVÁ

## % ') ` Ch\ Yf `F Y`UhYX`5 W]j ]hm]b`: M`&\$% `

Q,ÁQEFJÉA æ{ ] |^•Á;[{ Áç [Á, ^||•Á, ^|,^Ás[ ||^8c/åÁ[ ¦ÁFÊ Ëåā[¢æa)^Ása)æf`•ã Á[ ¦ÁJWHÁsa)}`æbÁæ{ ] |ā]\*Á ] |^•^}c/åÁ§ Á/æa|^ÁFHË ÉZ/@Á, ^||•Á æ{ ] |^åÁs[ } œæa)^åÁFÊ Ëåā[¢æa)^Ás[ } &^}dæaā[ } •Á ā[ ā]æsÁ§[ Ác@] •^Á |^] [ | c/åÁ{ ¦Ás@/Á, |^çā[ \* •Á æ{ ] |ā]\*Áç^} or È

## 14Á CH<9F = BGH5 @@5H=CB F9GHCF5H=CB 57H=J=H=9G 81F=B; : M & %

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 $CE_{A}^{a} \wedge ca_{A}^{a} \times A_{A}^{a} \approx A_{A}^{a} A_{A}^$ ^&{|[\* 38æ4Áã \ Á; Ás@ Á &{ • ^ • c^{ ÉX } å^! • cæ} åÁ\\ÙØY ÙÁ [ 憕 Á; ¦ÁÜ[ ` } åÁŠæ • É&ãã &` • • Á^{ ^ åãe4Á æ¢c\}æãç^•Êæjå&s^~j,^Ác@Aj,æc@Áj;; æåÁj; ¦ÄÜ[`}åÁŠæè^ĚÁ/@ÁŒ{{^Áj;[çãa^åÁs@ÁÜ[`}åÁŠæè^Á Ùٽ]]|^{^} ^} œahÁÜ^{{ ^åãæhÁQ;c^•cãtææañi}ÁQ;ÜODÖEZÙÁWÙQYÙÁÛ^]c^{{ à^\Á.ÉAGEFJÁ&[{ { ^}or Ása}iåÁCE{ ^ Á ¦^•][}•^•Á[Á@A`œà^@[å^¦•Á[}ÂÛ^] c^{ à^¦ÁFJÊKOEFJÈKOEÁ[^^@]\*Á; æ Á@|åÁ[}ÂÛ^] c^{ à^¦ÁGÍÊKOEFJÁ; ã@Á WÙØY ÙÊWÙÒÚCEÉT ÚÔCEÉaa å Á@ÁCE{ ^ ĚV@Á à b & cãc^•Á ~ Á@Á ^^cā \* Á ^¦^ Át Ásã &` •• Ás[ { { ^} o Á } ásó A } Ás@Á æť¦^^åÁs@ænÁ@AÛÜCÖZÙÁ,[`|åÁà^Á^çã^åÁàæe^åÁ;}Ás@Aæť¦^^åÁ][}A&A^æ}`]Aşæ†`^Á;AÉÈÁ;^æ}Á;[àæà|^Á ^~^&ox6k[}&^}dæaai}Á`[car}dÉko@ket|^^aAaiaoki +keecr}æaa^+ÉkeejaKei[{ { ^}o+Ai}Ako@ADÜCEZDEkkeel|A; æA @ | å Á; } ÁU & f à ^ ¦ Á EÉGEFJ Á ã QÁNÙ ØY Ù ÉÁNÙ Ò Ú CEÉAT Ú Ô CEÉA; å Ás@ ÁCE{ ^ Áş Ásã & \* • Ást] | 38 asà | ^ Á; ¦ Á ^ | ^ c a; o Á æ)åÅæ]]¦[]¦ãæe^Á^˘˘ã^{^`ã^{^`A}@HĂŒE{^Á\*à{ãœ^åÅ©@HÖ¦æex4ØäjæHÂŬ\*]]|^{^}cæHÄÜ^{^åãæHÁQ;ç^•cãtæeāi}}Á æ) å Á27æ) äð ajázî AUč å ^ Á[¦ÁÜ[`} å ÁŠæ) ^ ÁÞ^, ÁÓ¦ ät @] } EDELå^} ÁP a]|• ÁU`] ^¦~`} å ÁUãv Áæ) å ÁU^] cv{ à ^¦ÁGEFÌ Á Ù`]]|^{ ^} cædÁÜ^{ ^åãædÁQ;ç^•cãt æcāj}Áœd;åÁØ^æe;ãaãããc ÁÙc`å^Át¦ÁÜ[``}åÁŠæd;^Áp^, ÁÓ¦ãt`@t;}ÐDEå^}ÁPāļ•Á Ù"]^¦~`} å ÂÙã^ÁNÙØY ÙÁ&[{ { ^} @ Áæ} å ÁŒ{ ^Á^•][} •^•Á; Á@ Á œa ^@ |å^¦•Áæ} å ÁNÙØY ÙÊANÙÒÚŒÂ TÚÔŒÉæjåÁTāj}^•[œéÖ^]æto{^}of\\_Á#?æĕ`¦æ¢ÄÜ^•[`'\&^•/á\}ÄÖ^&^{ à^\Á\ÉGEFJÈKOEe^\'Á{\_{ { { a¢Á^\*`|æq[\^Á  $a_{i}^{\dagger} = \frac{1}{2} \left[ c_{i} a_{i} \Delta a_{i} \Delta a_{i} + \delta a_{i} \Delta a_{i} + \delta a_{i} \Delta a_{i} \Delta a_{i} + \delta a_{i} \Delta a_{i} + \delta a_{i} \Delta a_{i} + \delta a_{i} \Delta a_{i} + \delta a_{i} \Delta a_{i} + \delta a_{i} \Delta a_{i} + \delta a_{i} \Delta a_{i} + \delta a_{i} \Delta a_{i} + \delta a_{i} \Delta a_{i} + \delta a_{i} \Delta a_{i} + \delta a_{i} \Delta a_{i} + \delta a_{i} \Delta a_{i} + \delta a_{i} \Delta a_{i} + \delta a_{i} \Delta a_{i} + \delta a$ ÜUÖÈ

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- T[}c\*[{^¦^ÁY ææ•[}ÈÄrJJÍĖÁU]^¦æà|^ÁW}ãx/rÁ0E[cצ}æe^ÁY æe^¦ÁUĭ]]|^ÁÚ|æ)ÈÁØ8jæ4ÁÜ^][¦dÉÁU&q[à^¦ÁrJJÍĖÁ
- T[••|^\拾蘒@, ÁP čā 25 ČĂ TĚJI ČÁ & ČĂ (& X \* ]] ]^ÕÀ & ]¦ő^ čĂ (# 3 ; ]] / ČĂ (@ ÁP čā 25 ČĂ (# 3 ; ]) / ČĂ (# 3 ; ]] / ČA (# 3 ; ]] / ČA (#
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- Y^}&\ÈZG€€ÈàÈĂÛã&^ÁOEÁÙ@eq|[, ÁÕ¦[`}å, æe^\¦KÁT[}ã{[¦ā],\*Áæ}åÁÔ[}cā],\*^}&`ÁÚ|æ)ÈĂÙ^]c^{{à^¦ÁG€€ÈÈA

- Y^}&\ÈZG€FHàĚÄÜ^{{ ^åãæ¢ÁCB3cãį}}ÁÔ[{ ]|^cãį}Áæ;)åÁÔ|[•^ÁUč ơÄÜ^][¦dÊÁU[}åÁÕÈÄÞ[ç^{{ à^¦ÁG€FHÈĂ
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CdYfl	ſVYI b]h&.'G\U`ck 'Gc]``G]hYg					
ÀFË	Ù[đÁÜ^{ ^åãæa]}					
	ÁXÍÚão ÁCE	Ÿ^•	Ϋ́^•	Ÿ <b>^</b> ∙	FJJÏÁUWGÁÜUÖÉÄUWGÁ ÒÙÖÂAGÁGE€JDÉÁUWGÁ ÜUÖÁCE[^}å{^}œÁÍÁ ÇG€FID	
	ÁÁÚ ã^ ÁÔ	Ϋ́^•	Ÿ <b>^</b> ●	Ÿ <b>^</b> ∙	fjji ájwgáüuö	
	ÁÁÚ ã^ ÁÒ	Ÿ <b>^</b> ∙	Ÿ∧∙	Ÿ^ <b>●</b>	FJJÏÁUWGÁÜUÖÉÄUWGÁ ÜUÖÁCĘ(^}å{^}åÅHÁ ÇG€€JD	
	ÁMÚ ác <sup>s</sup> ÁR	Ÿ^•	Ÿ۸∙	Ÿ^ <b>•</b>	FJJÏÁUWGÁÜUÖÊÄUWGÁ ÜUÖÁQĘI^}å{ ^}œÀHÁ ÇG€€€JD	
	ÁÁÚã ÁFGJËH	Ÿ^ <b>•</b>	Ÿ <b>^</b> ∙	Ÿ <b>^</b> ∙	FJJÏ ÁJWGÁÜUÖÊÄJWGÁ ÒÙÖÂḋGÁÇE€€JD	
	ÁŇŨã^ ÁFGI Ĕ	Ϋ́^•	Ÿ <b>^</b> ∙	Ÿ <b>^</b> ∙	FJJĨ ÁUWGÁÜUÖÊÁUWGÁ ÒÙÖÂĠÁÇŒEJD	
	₩Ю́¦^}æå^ÂÜæ)*^	Ϋ́^•	Ϋ́^•	Ÿ <b>^</b> ∙	FJJIAUWGÁÜUÖÄÜUWGÁ ÜUÖÁQE[^}å{ ^}œÁHÁ ÇG€€EJD	
	ÁÁÁUč cå[[¦Á2ālā]*ÁÜæ)*^	Ÿ٨•	Ÿ <b>^</b> ∙	Ÿ^∙	FJJÏÁUWGÁÜUÖÉÃUWGÁ ÜUÖÁQĘI^}å{ ^}œÁHÁ ÇG€€€JD	

## HUV`Y`%% GHUri g`cZFYa YX]U`5Wi]cbg : M`&\$%`5bbi U`FYdcfh Hk]b`7]h]Yg`5fa m5a a i b]h]cbg`D`Ubh 5fXYb`<]`gžA]bbYgcHU

	F Ya YXm7 ca dcbYbh	=gʻih∖Y`WcadcbYbh' VY]b[ʻ ]ad`YaYbhYX3	=gʻiħ Yʻ₩ca dcbYbh Xc]b[ʻk \ Uh]h]gʻ gi ddcgYXʻhc3	<ugʻh\y`wcadcbybh ibXYf[cbY`Z]bU` WicgYcih3</ugʻh\y`wcadcbybh 	8YW]g]cb <sup>∶</sup> 8cWiaYbh	
CdYf	JV`Y`Ib]h'&`G\U`ck`Gc]``G]hYgʻ7 cbh]biYX					
	ÁÁAFHÍÁÚVOEÁÚq[¦{,æe∿¦ÁÖãa&@	Ϋ́^•	Ϋ́^•	Ÿ۸•	Fjjïáuwgáüuöfáuwgá ÜuöáQĘ^}å{ ^}óÀhá ÇG€€jDÉAUWGÁÜUöÁ QĘ^}å{ ^}óÀÍÁÇG€FID	
	ÁÁÁ HÍÁÚ¦ā[^¦ÐV¦æ&^¦ÁŒ!^æ	Ϋ́^•	Ÿ^ <b>●</b>	Ÿ۸•	FJJÏÁUWGÁÜUÖÉÄUWGÁ ÜUÖÁQĘ[^}å{_^}óÂIÁ Ç⊖EFGD	
	ÁÁÚã~ÁSÁÚ[ ā•	Ÿ∧∙	Ÿ۸•	Ÿ۸•	Fjjïáuwgáüuöféuwgá ÜUÖÁQE[^}å{ ^}œâiá ÇGEFGD	
	Á₩Yær^¦Á/[¸^¦ÁŒ^æ	Ÿ <b>^</b> ∎	Ÿ <b>^</b> ∎	Ϋ۸•	FJJÏÁUWGÁÜUÖÉÃUWGÁ ÜUÖÁQĘ[^}å{_^}ďÂHÁ ÇG€€JD	
	ÁÁUI (JÁCE) Ô•ÁQUã~ÁCEÁFHÍ ÁÚVCEÁOÓÙÁCE^æ D	Ϋ́^∙	Ϋ́^∙	Ϋ́^∙	fjji <b>á</b> jwgáüuö	
ÀÌ	Ő¦[č}å,æev\¦ÁT[}ãt[¦ãj*	Ϋ́^●	Ϋ́^●	Ϋ́^∙		
ÀJ	Ô@eebæ&ec^¦ãæeaāį}Áį,~ÄÕ~{]•	Ÿ^∙	Ÿ^∙	Ÿ^∙		
	ÁNU ão ÁO	Ÿ <b>^</b> ∙	Ÿ <b>^</b> ∙	Ÿ <b>^</b> ∙	FJJÏ ÁJWGÁÜUÖÉÁUWGÁ ÒÙÖÁÀGÁÇG€€JD	
	ÁÁÚã~ÁFGJËTÍ	Ϋ́^•	Ϋ́^•	ŸΛ∎	FJJÏÁUWGÁÜUÖÉAUWGÁ ÜUÖÁQĘ[^}å{^}ơÂHÁ ÇG€€JD	
ÀF€	Šæ);åÁ∿•^ÁÔ[}d[ •	Ÿ^•	Ϋ́^•	Þ[	UWGÁÜUÖÁ OĘ^}å{^}♂Áæ)åÁ ÒÙÖ+ÉAUWGÁSWÔÜÖ	Q2] ^{ ^} cæeāį}Áį
	Uç^¦æļÁÜ^{ ^å^	Ϋ́^∙	Ϋ́^∙	Úækaæk ^		
CdYf	JV`Y`I b]h&`8 YYd`Gc]``G]hYg					
ÀF	Õ¦[˘}å, æe^¦ÁT[}ãt[¦äj*	Ÿ <b>^</b> ∙	Ÿ <b>^</b> ∙	Ÿ <b>^</b> ∙	fjjï ájwgáïuö	
ÀG	Ü^•da&cAÛãcAQB&&^••AÖč¦āj*AÜ^{ ^åãeeaā[}	Ÿ <b>^</b> ∙	Ÿ <b>^</b> ∙	Ÿ <b>^</b> ∙	fjjï ájwgáïuö	Ś[}*Ëz^¦{Ájaa}åÁ Ô[{][}^}o5Ai
ÀH	ÙXÒÂĴ^∙♂{•	Ϋ́^•	Ϋ́^•	Ϋ́^•	fjjï ájwgáïuö	Ù^•ơ\{•À,^¦^Áč ¦
ÀI	Ò}@ee)&^{ ^}@A{[AÛXÒAÛ^•@{ •	Ÿ^ <b>●</b>	Ϋ́^•	Ÿ^ <b>●</b>	fjji <b>á</b> jwg <del>á</del> üuö	Þ^ão@\Á^•c^{ Á^ •^•c^{ ●Á@æç,^Áà^/

PI	<b>K</b> A
AR	CADIS
a joint 7 ca a Ybhg	venture
Á: Á@ÁUWGÆWÔÜÖÆA Á Á	∑}*[ậ]*Á^~`ã^{ ^}œÈ

åÁ•^Á&[}d[|•Áæb^Áæåå¦^••^åÁàˆÁÜ^{{^å^Á

č¦}^åÁį~~Á§jÁ∓JJÌÈ

Á^``āl^åÁ[]^¦æaā[}Ájão@Á\}@aa)&^{^}orÈKÓ[c@ÁUXÒÁ ≦a^^}Ásã{aa)q^åÈ

## HUV`Y`%I% GHUhi g`cZFYa YX]U`5WF]cbg : M`&\$%`5bbi U`FYdcfh Hk]b`7]h]Yg`5fa m5a a i b]h]cbg`D`Ubh 5fXYb`<]`gžA]bbYgcHU

	F Ya YXṁ7 ca dcbYbh	=gʻihi Y`WcadcbYbh' VY]b[ʻ ]ad`YaYbhYX3	=gʻh\Y`WcadcbYbhi Xc]b['k∖Uhi]hi]gʻ giddcgYX'hc3	<ugʻh\y`wcadcbybh ibXYf[cbY`Z]bU` WicgYcih3</ugʻh\y`wcadcbybh 	8YW]g]cb <sup>∶</sup> 8cWiaYbh	
ÀÍ	Tænāj cænāj ÁÖ¢ērcāj*ÁĴaz∿ÁÔænij∙	Ÿ٨•	Ÿ٨•	Ÿ٨•	fjjï <b>á</b> jwgájuö	V@#Á^{^^â^&&[{ [-Áxxã-+[], Á, @}}Á  a3) åÁ ●^Á&[}d[  Ùã?∿● KÖÁs3) åAÕÁG Ùã?∿KÕÁsĩ {] DÁs6/
ÀÎ	Tænāj œaāj ÂÙĭ¦-æa&∧ÁÖ¦ænāj æt*^ÁÔ[}d[ •	Ϋ́^∙	Ϋ́^∙	Ϋ́^∙	fjjï ájwgáïuö	
ÀÏ	Ô@eetæ&ec^¦ã^ÂÛ@eet [,ÂÛ[ā]•Áeet;åÄÖč{]	Ϋ́^∙	Ϋ́^∙	Ϋ́^∙	fjjï ájwgáïuö	
ÀÌ	Šæ)åÁ∿•^ÁÔ[}d[ •	Ÿ^ <b>●</b>	Ϋ́^∙	Þ[	fjjï ájwgáüuö	Q;] ^{ ^} cæeāj}} Á
	Uç^¦æļÁÜ^{ ^å^	Ϋ́^∙	Ϋ́^∙	Úælæ		



a joint venture

#### 7 ca a Ybhg

{][}^}o^{(,, 200 Å 56]}o^{(, 200 Å 56]} a^{(, 200 Å 56]} a^{(, 200 Å 66]}

Á;-Ás@∘ÁUWGÁŠWÔÜÖÁ≨sÁæ)Á;}\*[ā]\*Á^˘˘ā^{^}d⊂

## HUV`Y`%% GHUHigʻcZFYaYX]U`5WFjcbg :M`&\$%`5bbiU`FYdcfh Hk]b`7]HjYgʻ5fam5aaib]HjcbgʻD`Ubh 5fXYb`<j``gžA]bbYgcHU

	F Ya YXm7 ca dcbYbh	=gʻili YʻWca dcbYbh' VY]b[ʻ ]a d`Ya YbhYX3	=gʻh\Y`WcadcbYbhi Xc]b['k\Uhi]hi]gʻ giddcgYX'hc3	<ugʻl\y`wcadcbybh ibXYf[cbY`Z]bU` WcgYcih3</ugʻl\y`wcadcbybh 	8YV¶g]cb <sup>∶</sup> 8cWiaYbh	
CdYfl	N^Yl b]h&.ʿG]hY′5 ʿG∖U``ck ˈ; fcibXkUh¥f					
ÀF	Õ¦[ັ}å,æe∿¦ÁT[}ãq[¦ā]*	Ϋ́٨•	Ÿ <b>^</b> ∙	)¢	fjjï ájwgáüuö	
ÀG	Õ¦[`}å,æe^¦ÁÔ[}œæä}{ ^}d⊟Tæ∙ÁÜ^{{ [çæ‡	Þ[	Þ[ 0 <sup>(</sup> 0]; ]  \$8æè ^	Þ[	fjji <b>Á</b> jwg <b>á</b> ïuö	V@\Át¦[`}å,æe^ ,æe/A§,Áiœa),åà^Aj
ÀHŒ	Šæ)åÁ∿•^ÁÔ[}d[ •	Ÿ <b>^</b> ∙	Ÿ <b>^</b> ∙	Þ[	Fjjï ájwgáïuöéájwgá Òùöậƙf	Q[] ^{ ^} cæaā[}/
ÀНÓ	Ö¦ä  a] *ÁO£åçãr[¦^£O0‡¢c^\}æe^ÁYæe^\ÁÛč]] ^£Y^  ÁO£àæa)å[}{ ^} c	Ϋ́^∙	Ϋ́^∙	Þ[	fjjï ájwgáüuö	
ÀI	Öãr&@eel*^Áį, AÔ¢ctæ&cråÁY æerr¦	Þ[	Þ[0405]] \$8æà ^	Þ[	fjjï ájwgáüuö	Ù^^&&[{ { ^}} oÁ{
ÀÍ	Ù[˘¦&^ÁÔ@eelæ&cơ\¦ãæeaąī}ÁÜ^{{ ^åãæeaąī}}	Ϋ۸•	Ÿ <b>^</b> ●	Ϋ́^∙	fjji ájwgáüuö	
	Uç^¦æ∣ÁÜ^{ ^å^	Ϋ۸•	Ÿ <b>^</b> ∙	Þ[	FJJÏÁUWGÁÜUÖÉÃUWGÁ ÜUÖÁQE[^}å{^}ďÁÌÁÁ ÇGEFÌD	WÙÒÚŒ£aa)åÁTÚ ⊈ÁTÞŒEĂŒÆÜUÖ GEEFÌÁ
CdYfl	ĴV`Y`Ib]h&.ʿG]hY′7 ʿG∖U``ck ʿ; fcibXkUhYf					
ÀF	Õ¦[`}å, æe^¦Áæ)åÁÙ'¦~æ&^ÁY æe^¦ÁT[}ãt[¦ā]*	Ϋ۸•	Ϋ۸•	Þ[	UWG4ÜUÖÁ0E[^}å{ ^}a' ÀFÁÇG⊖∈EÏD	<b>N</b>
ÀG	Õ¦[˘}å,æe∧¦ÁÔ[}œæäj{^}c	Þ[	Þ[ 040]]  \$8æà ^	Þ[	UWG4ÜUÖÁ0E[^}å{ ^}a' ÀFÁÇG⊖∈EÏD	Ùāj&^Áo@^Á/>æåÁj <sup>\*</sup> ¦[`}å,æe^¦Á^¢a {[}ãq[¦āj*Á,ā Ás
ÀH	Öãr&@eel*^Á[√ÁÔ¢clæ&c∿åÁYæe∿¦	Þ[	Þ[ cÁC]; ]  ã&æà ^	þ[	UWGÁÜUÖÁQĘ^}å{^}ď ÀFÁÇG⊖∈ÏD	∖ Ù^^Á&[{{^}∂⊄[
ÀI	Šæ) åÁ∿∙^ÁÔ[}d[ •		Ϋ́^•	þ[	UWGÁÜUÖÁQĘ^}å{^}ď ÀFÁÇG⊖∈ÏD	Q] ^{ ^} cæaaj }/
	Uç^¦æļÁÜ^{ ^å^	Ϋ́^•	Ϋ́٨•	Þ[	UWGÁÜUÖÁ0E[^}å{ ^}ď ÀFÁÇG⊖∈EÏD	<b>N</b>
1						



\'Á¢clæ&cāj}Á^•c^{{ Á æ Á @ c4, --Á}}ÁJEOHBEÌÁæjåÁ §@å^Ásj]|^{ ^}cæeāj}Á;Á^TÞOEA,æ Á çæ;řæe\*åEÁQQÁ

Á,Áx@÷ÁUWGÁŠWÔÜÖÆ;Áxa)Á,}\*[ā]\*Á^˘ĭā^{^}d⊂,

¦ÁÜ^{ ^å^ ÁÔ[ { ] [ } ^} ơÂĤGÈ

Ô O Đế đếng ^ Áng ] ¦[ç^ å Áng Át ¦{ ap Á& đếng \* ^ Át – Áng Ó Á ^ { ^ å ^ Á Áng { ^} å { ^} o ag Á ¦^ ] ad ^ å Áng à Áng ] ¦[ç^ å Áng Á ơ ♈ Á

.|`{^Á,[Á[}\*^¦Ár¢or}å•Á[Áo@Ár¢dæscaī]}Á,^||•Éao@Á dæscaī}}Á^•or{{Á æ•Á@oA;~A[}ÁFFBFHBBÌÉÁO?č¦^Á à^or¦{a]^Á,@ro@¦ÁaaAÜUÖÁ;[åãa38aaaaī]}Á;a]A≦a^Á

¦ÁÜ^{ ^å^ ÁÔ[{][}^} @AÂGÈ

Á;-Ás@∘ÁUWGAŠWÔÜÖ/≦sÁsa)Á;}\*[ā)\*Á^˘ĭā^{^}dè

## HUV`Y`%% GHUri g`cZFYa YX]U`5WFjcbg : M`&\$%`5bbi U`FYdcfh Hk]b`7]hjYg`5fa m5a a i b]hjcbg`D`Ubh 5fXYb`<]`gžA]bbYgcHU

	F Ya YXm7 ca dcbYbh	=gʻihi Y`WcadcbYbhi VY]b[ʻ ]ad`YaYbhYX3	=gʻih\Y`WcadcbYbhi Xc]b[ʻk\Uhi]hi]gʻ giddcgYX'hc3	<ugʻh\y`wcadcbybh ibXYf[cbY`Z]bU` WicgYcih3</ugʻh\y`wcadcbybh 	8YV¶g]cb <sup>:</sup> 8cWiaYbh	
CdYfl	JV`Y`Ib]h&.ʿG]hY'≓G\U``ck ˈ; fcib XkUh¥f					
ÀF	Õ¦[`}å,ææ^¦ÁT[}ãq[¦ā]*	Ÿ۸∙	Ÿ <b>^</b> ∙	Þ[	fjjï ájwgájuö	
ÀG	ට සි ය ක් කි ද ය ක් කි කි කි කි කි කි කි කි කි කි කි කි කි	Ÿ <b>^</b> •	Ÿ <b>^</b> •	Ÿ∧∙	FJJÏÁUWGÁÜUÖÉÄUWGÁ ÜUÖÁQĘI^}å{ ^}œÅGÁ ÇG€€€JD	
ÀH	Šæ);åÁ∿≢^ÁÔ[}d[ •	Ÿ٨•	Ϋ۸∙	Þ[	UWGÁÜUÖÁ0E[^}å{^}ď ÀFÁÇG⊖∈EÏD	Q;] ^{ ^}cæaā[}/
	Uç^¦æļÁÜ^{ ^å^	Ϋ́^•	Ϋ́^∙	Þ[	fjji <b>á</b> jwgáïuö	
CdYfl	/ JV`Y`Ib]h&.`G]hY`?`G\U``ck `;fcibXkUhYf					
ÀF	Ő¦[ັ}å, æe∿¦ÁT[}ã¢[¦ā]*	Ϋ́^∙	Ϋ́^∙	Þ[	fjji <b>á</b> jwgáüuö	
ÀG	Ù^} @}^ ÁY ^  •	Ϋ́^∙	Ϋ́^∙	Ÿ^ <b>●</b>	fjji <b>Á</b> jw <b>gá</b> ïuö	
ÀH	P^妿ĕ ã&ÁÔ[}œæä]{^}c	Ϋ́^∙	Ϋ́^∙	Þ[	fjji <b>á</b> jwgáüuö	
ÀI	Õ¦[`}å,æe^\¦Á/¦^æe{^}c	Ÿ^ <b>●</b>	Ÿ^ <b>●</b>	Þ[	fjjï <b>Á</b> jw <b>GÁ</b> ÜUÖ	
ÀÍ	V¦^æe^åÁY æe^¦ÁÖãr&@eet*^	Ϋ́^∙	Ϋ́^∙	Þ[	fjjï ájwgájuö	
ÀÎ	Öãr&@æd≉^ÁT[}ã[¦ã]*	Ÿ <b>^</b> ∙	Ÿ <b>^</b> ∙	Þ[	fjji ájwgáüuö	
ÀÏ	CEååãdāį}æ¢ÁQiç^∙dā*æaāį}	Ϋ́^∙	Ÿ^ <b>●</b>	Ϋ́^∙	fjjï ájwgáïuö	
ÀÌ	Šæ);åÁ∿•^ÁÔ[}d[ •	Ÿ <b>^</b> •	Ϋ́^•	Þ[	UWCÁÜUÖÁQĘ^}å{^}ď ÀFÁÇG⊖∈ÏD	Q[] ^{ ^} caeca[]}/
	Uç^¦æļÁÜ^{ ^å^	Ϋ́^∙	Ϋ́^∙	Þ[	fjjï <b>á</b> jwgáüuö	
CdYfl	JV`Y`Ib]h'&∵6i]`X]b[`%\$&`G\U`ck`;fcibXkUh%f					
ÀF	T[}ãt[¦^åÁÞæčˈ¦æ‡ÁŒcc^}čæaā]}	Ÿ <b>^</b> •	Ÿ <b>^</b> •	Þ[	UWGÁÜUÖÁQĘ^}å{^}ơ <sup>†</sup> ÀIÁÇG€FGD	4
ÀG	Õ¦[`}å,ææ∿¦ÁT[}ã¢[¦ā]*	Ÿ <b>^</b> ∙	Ϋ۸∙	Þ[	UWGÁÜUÖÁQĘ^}å{^}ď ÀIÁÇG€EFGD	4
ÀH	Šæ);åÁ∿•^ÁÔ[}d[ •	Ÿ <b>^</b> •	Ϋ́^•	Þ[	UWGÁÜUÖÁ0E[^}å{^}ơ ÀIÁÇG€FGD	(Q] ^{ ^} caeaaaa}/
	Uç^¦æļÁÜ^{ ^å^	Ÿ <b>^</b> •	Ÿ^•	Þ[	UWGÁÜUÖÁQĘ^}å{^}ď ÀIÁÇG⊖EFGD	ίλ.



## HUV`Y`%% GHUhi g`cZFYa YX]U`5WF]cbg : M`&\$%`5bbi U`FYdcfh Hk]b`7]h]Yg`5fa m5a a i b]h]cbg`D`Ubh 5fXYb`<]`gžA]bbYgcHU

	F Ya YXm7 ca dcbYbh	=gʻh\Y`WcadcbYbh' VY]b[ʻ ]ad`YaYbhYX3	=gʻh\Y`WcadcbYbhi Xc]b[ʻk\Uhi]hi]gʻ giddcgYX'hc3	≺Ugʻh\Y`WcadcbYbh ibXYf[cbY`Z]bU` WcgYcih3	8YV¶g]cb <sup>∶</sup> 8cWiaYbh	
CdYfl	𝕂́Ϋ́I b]h&`5ei UhjWGjhYg					
ÀF	Ú[}åÁÕÁÙĭ¦-æ&^ÁY æe^¦Á/¦^æ{{ ^}c	Ÿ <b>^</b> ∙	Ÿ <b>^</b> ●	Ÿ <b>^</b> ∙	UWGÁÜUÖÁQĘ(^}å{(^}ơ ÀIÁÇG€FGD	4
ÀG	Ú[}å,ÁÕÁÙ`¦-æ&^ÁYæe^\ÁT[}ãt[¦ā]*	Ÿ۸∙	Ÿ^ <b>•</b>	Ÿ۸∙	UWGÁÜUÖÁQĘ^}å{^}ơ ÀIÁÇG€EFGD	4
	Uç^¦æļÁÜ^{ ^å^	Ÿ <b>^</b> ∙	Ÿ^ <b>●</b>	Úælæ		
CdYfl	√Y`Ib]h&.'8 YYd'; fcibXkUhYf					
ÀF	P^妿ĕ ã&kÁÔ[}œæäj{ ^}œÆajåkÁÔ[}œæ{ājæa)oÁTær∙ÁÜ^{{ [çæ‡	Ÿ^ <b>•</b>	Ϋ́^∙	Þ[	fjji <b>á</b> jw <b>gá</b> juö	
ÀG	Õ¦[`}å,æe^\¦Á/¦^æe{^}c	Ÿ <b>^</b> ∙	Ÿ <b>^</b> ∙	Þ[	fjji <b>Á</b> jwgáïuö	
ÀH	V¦∧æe∿åÁYæe∿¦ÁÖãr&@eel*∧	Ÿ^∙	Ÿ <b>^</b> ∙	Þ[	fjjï ájwgáïuö	
ÀI	Šæ)åÁ∿•^ÁÔ[}d[ •	Ÿ^ <b>•</b>	Ÿ <b>^</b> ∙	Þ[	fjjï ájwgáüuö	Q;] ^{ ^} cæcāj},
ÀÍ	Ü^çða , Á , Á~, Á/^&@ [  [ * ð.•	Ϋ́^∙	Ϋ́^∙	Þ[	fjji <b>á</b> jw <b>gá</b> juö	Ô˘¦¦^}qˆÁ∿çæqǐa
ÀÎ	Õ¦[ັ}å, æe∧¦ÁT[}ãt[¦ā),*	Ÿ <b>^</b> ∙	Ÿ^∙	Þ[	fjji ájwgáüuö	
	Uç^¦æļÁÜ^{^å^	Ϋ́^∙	Ϋ́^∙	Þ[		
CdYfl	ŴY`Ib]h'. 8YYd`; fcibXkUhYf					
ÀF	T[}ãt[¦^åÁÞæč¦æ‡ÁŒc^}čæaā]}	Ÿ <b>^</b> •	Ÿ <b>^</b> •	Þ[	UWHÁÜUÖÁΩĘ^}å{^}ơ À FÁÇG⊖€ÊD	4
ÀG	Ő¦[`}å,æe∿¦ÁT[}ãq[¦a];*	Ÿ∧∙	Ÿ <b>^</b> ∙	Þ[	UWHÁÜUÖÁQĘ^}å{^}ơ ÀFÁÇG⊖€ÎD	( Š[}*Ëơ\¦{Ápæ)jå/ Ô[{][}^}oÁÀÌ
ÀH	Ö¦āļļā, * ÁDĒåçã; [¦ā∿∙	ŸΛ•	Ÿ <b>^</b> ∎	Þ[	UWHÁÜUÖÁQĘ^}å{^}ơ ÀFÁÇG⊖€ÊD	4
	Uç^¦æ∥ÁÜ^{ ^å^	Ÿ <b>^</b> •	Ÿ <b>^</b> ∙	Þ[	FJJGÁUWHÁÜUÖÉAUWHÁ ÜUÖÁOE[^}å{^}óÂHFÁ ÇG€€€ÎD	

## 5 Wichmag UbX 5 VVfYj]Uhjcbg.

PIKA
ARCADIS a joint venture
7 ca a Yblg
[,-Ác@,ÁUWCAŠWÔÜÖ Ása Ása),Á[,}*[ā]*Á^``ā^{^}⊄È ea3)*Á[]cā[ ãæaā[}Árdæe^*ā∿Á[¦Ác@ Á/ÕÜÙ
〔•^Á&[}d[ •Áæd^Áæåå¦^••^åÁaˆÁÜ^{ ^å^Á

## HUV`Y`%% GHUhi g`cZFYa YX]U`5WF]cbg : M`&\$%`5bbi U`FYdcfh Hk]b`7]h]Yg`5fa m5a a i b]h]cbg`D`Ubh 5fXYb`<]`gžA]bbYgcHU

	F Ya YXm7 ca dcbYbh	=gʻh\Y`WcadcbYbh' VY]b[ʻ ]ad`YaYbhYX3	=gʻh\Y`WcadcbYbhi Xc]b[ʻk\Uhi]hi]gʻ giddcgYX'hc3	≺Ugʻh\Y`WcadcbYbh ibXYf[cbY`Z]bU` WcgYcih3	8YV¶g]cb <sup>∶</sup> 8cWiaYbh	
CdYfl	ƘY'Ib]h&`5eiUh]WG]hYg					
ÀF	Ú[}åÁÕÁÙĭ¦-æ&^ÁY æe^¦Á/¦^æ{{ ^}c	Ÿ <b>^</b> ∙	Ÿ <b>∧</b> ∙	Ÿ <b>^</b> ∙	UWGÁÜUÖÁQĘ(^}å{(^}ơ ÀIÁÇG€FGD	4
ÀG	Ú[}å,ÁÕÁÙ`¦-æ&^ÁYæe^\ÁT[}ãt[¦ā);*	Ÿ۸∙	Ÿ^ <b>•</b>	Ÿ۸∙	UWGÁÜUÖÁQĘ^}å{^}ơ ÀIÁÇG€EFGD	4
	Uç^¦æļÁÜ^{ ^å^	Ÿ <b>^</b> ∙	Ÿ^ <b>●</b>	Úælæ		
CdYfl	√Y`Ib]h&.'8 YYd'; fcibXkUhYf					
ÀF	P^妿ĕ ã&kÁÔ[}œæäj{ ^}œÆajåkÁÔ[}œæ{ājæa)oÁTær∙ÁÜ^{{ [çæ‡	Ÿ^ <b>•</b>	Ϋ́^∙	Þ[	fjji <b>á</b> jw <b>gá</b> juö	
ÀG	Õ¦[ັ}å,æe∧¦Á/¦^æe{^}c	Ÿ <b>^</b> ∙	Ÿ^ <b>●</b>	Þ[	fjji <b>Á</b> jwgáïuö	
ÀH	V¦∧æe∿åÁYæe∿¦ÁÖãr&@eel*∧	Ÿ^∙	Ÿ <b>^</b> ∙	Þ[	fjjï ájwgáïuö	
ÀI	Šæ)åÁ∿•^ÁÔ[}d[ •	Ÿ^ <b>•</b>	Ÿ <b>^</b> ∙	Þ[	fjjï ájwgáüuö	Q;] ^{ ^} cæcāj},
ÀÍ	Ü^çða , Á , Á~, Á/^&@ [  [ * ð.•	Ϋ́^∙	Ϋ́^∙	Þ[	fjji <b>á</b> jw <b>gá</b> juö	Ô˘¦¦^}qˆÁ∿çæqǐa
ÀÎ	Õ¦[ັ}å, æe∧¦ÁT[}ãt[¦ā),*	Ÿ <b>^</b> ∙	Ÿ <b>^</b> ∙	Þ[	fjji ájwgáüuö	
	Uç^¦æļÁÜ^{^å^	Ϋ́^∙	Ϋ́^∙	Þ[		
CdYfl	ŴY`Ib]h'. 8YYd`; fcibXkUhYf					
ÀF	T[}ãt[¦^åÁÞæč¦æ‡ÁŒc^}čæaā]}	Ϋ́^•	Ÿ <b>^</b> •	Þ[	UWHÁÜUÖÁΩĘ^}å{^}ơ À FÁÇG⊖€ÊD	4
ÀG	Ő¦[`}å,æe∿¦ÁT[}ãq[¦a];*	Ÿ∧∙	Ÿ <b>^</b> ∙	Þ[	UWHÁÜUÖÁQĘ^}å{^}ơ ÀFÁÇG⊖€ÎD	( Š[}*Ëơ\¦{Ápæ)jå/ Ô[{][}^}oÁÀÌ
ÀH	Ö¦āļļā, * ÁDĒåçã; [¦ā∿∙	ŸΛ•	Ÿ <b>^</b> ∎	Þ[	UWHÁÜUÖÁQĘ^}å{^}ơ ÀFÁÇG⊖€ÊD	4
	Uç^¦æ∥ÁÜ^{ ^å^	Ÿ <b>^</b> •	Ÿ <b>^</b> ∙	Þ[	FJJGÁUWHÁÜUÖÉAUWHÁ ÜUÖÁOE[^}å{^}óÂHFÁ ÇG€€€ÎD	

## 5 Wichmag UbX 5 VVfYj]Uhjcbg.

PIKA
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[,-Ác@,ÁUWCAŠWÔÜÖ Ása Ása),Á[,}*[ā]*Á^``ā^{^}⊄È ea3)*Á[]cā[ ãæaā[}Árdæe^*ā∿Á[¦Ác@ Á/ÕÜÙ
〔•^Á&[}d[ •Áæd^Áæåå¦^••^åÁaˆÁÜ^{ ^å^Á

#### HUV`Y`' !% GiaaUfmicZCI %Acb]hcf]b[`FYei]fYaYbhg :M&\$%`5bbiU`FYdcfh Hk]b'7]h]Yg`5fami5aaib]h]cbg`D`Ubh 5fXYb`<]`gžA]bbYgchU



F Ya YXm7 ca dcbYbh	A cb]hcf]b[ `F Yei ]f Ya Ybhg	<b>⊨a</b> d`Ya Ybh]b[ ˈDUfhm	8 c₩ia Ybhgʻ7 cbhU]b]b[ʻh\YʻA cb]hcf]b[ʻD`Ub
. Ωπαλ!\aan∧Áγ aan∧!Δἶἕ111^ΔΠάν ∧‼Δ	æÈYæ¢\¦Áĭæ¢ãĉÁsææAv[¦Ás@Aj\^¦ã[^cr\Aj,As@Á ] ĭ{^Ás[Ás∿-3j,^Ás@Áse/æ4j\As[}8v\}	OE{ ^	UWFÁŐ¦[`}å,æe^\ÁT[}ãt[¦ā)*ÁÚ æ),Ás),Ás@Á03;}`æ)Á Ú^¦-{[¦{æ);&^ÁÜ][¦c
ÁFK Otaa) å[}{ ^}c	àÈY æe^\{Á`ă¢aɛ͡/kiaææaÁ{[¦Á; æe^\{Á`]]}^Á, ^∥•Át[Á å^e^\{ ā}^Á\[ðīāàājāc͡Á{[¦Áæ¢e^\} æe^Á •`]] ^Bæàæ)å[}{ ^} c	OE{ ^	Y^  ÁQşç^}₫¦^ÂÜ^][¦c
ÀGK Ö¦ậ ậ * ÁŒaçã [¦ã•	æbĂX^¦ãaBæcaāį}Åo@eenAsi¦ājlāj*Ásenėçãa[¦ã∿∙Áseh^ÁsjÁ ] æ&AÁse)åÁ¥}&caāį}āj*ÁsenéAsjc^}å^å	Œ{ ^Ð ÖP	ÞÆ
ÀHK Ò¢dæ&dớÕ¦[˘}å,æe^¦	æÈÚ`{]āj*Áç[ `{^Áæ)åÁææ∿•Á{¦Á*æ&@Á ^¢dæ&aãi}Á_^  Á{¦Á&[{]æåã[}Á{[Áæ3*^oÁ -√[,¦ææ∿•	Þ^, ÁÓ¦ãi@{;}	Þ^, ÁÓ¦ā*@q{}ÁÝææ∿¦ÁÛ^∙c∿{ÁÛæ∢] āj*Áæ),åÁ OEj憰•ãÁÚ æ);
	àÈY ææ^¦Áp^ç^ •Á+[{Á;[}ãā[¦ā]*Á;^  •Áð[Á 妿;Á&[}d[`¦Á;æ]]•É&5x4å^•ā1^åÁ	O₽{ ^	UWFÁÕ¦[`}å, æe^¦ÁT[}ãt[¦ã)*ÁÚ æ);Á5jÁo@ÁO5;}`æ‡Á Ú^¦-{¦{æ);&^ÁÜ^][¦c
ÀI K Ü^{ [çæ‡́{ -∕́XUÔ•	æÈ Ò⊶,ĭ^}oÁ,æe^\¦Áĭæ,äãĉÁų[Áå^{[}∙dæe∿Á &[{] ãaa)&^Á,ãoo áo@ áùæ~AÖ¦āj∖āj*Á Yæe^\¦Á038c	Þ^, ÁÓ¦ãt@{[}	Þ^, ÁÓ¦āî@a[}ÁYæac∿¦ÁÙî∙or\{ÁÛæq{] āj*Áæ)åÁ OEjæ‡î∙ãrÁÚ æ)
ÀÍK Öãr&@zel*^Á[-Á/¦^æz^åÁ/æz^¦	æÈX^¦ãa3kæaa≨i}Á;Áåãa&@eeb*^	Þ^,ÁÓ¦ãt@q[}	ÞÆ
- Õ¦[`}å, æe∿¦ÁT[}ãt[¦ð],*Á, ão@Á	æÈYæc^¦Á ઁæ¢ãĉÊÁ&(Áæ••ãró45)Á^çæ¢ੱæcā[}A[-Á •cæcãrcã&æ¢4&[]¦[ç^{ ^}orÁ5)Á*¦[č}å,æc^¦Á č æ¢ãĉÈ	OE{ ^	UWFÁÕ¦[`}å, æe^¦ÁT[}ãį[¦ā]*ÁÚ æ),Á§JÁo@AO5;}`æ Á Ú^¦-{¦{ æ);&^ÁÜ^][¦c
CE čã^¦ÂÜ^∙q[¦æậ]}	àÈYæz^¦Á`æ¢ãĉÁsææók@[`*@[`ók@A¤[¦o@Á Ú `{^Áş[Á^çæ;ăæ^Á^{^åãæ¢Á;¦[*¦^••	O∄{ ^	UWFÁÕ¦[`}å, aac^¦ÁT[}ãt[¦ā)*ÁÚ aa)Á5JÁo@ÁO5J}`aa Á Ú^¦-{¦{ aa)&^ÁÜ^][¦c

#### 5 Wichma gʻUbX`5 VVfYj]Uhjcbg.

TÖPÁEAT áj}^•[cæ4Ö^] æ3c{^}o4[~AR^a¢o@ Þ5025EA[[c444]] |38æ3e|^ UWFÆAU]^¦æ3e|^ÁW}ãaAF

#### HUV`Y`' !& CI %; fci bXk UhYf`Ei U`]mi8 UHJ : MT&\$% `5 bbi U`FYdcfh Hk ]b`7 ]h]Yg`5 fa mi5 a a i b]h]cbg`D`Ubh 5fXYb`<]``gžA]bbYgcHJ



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GUa d`Y`@cWUIjcb	8 UhY	Hf]W(`cfcYh\YbY` f⊯[#@L	%2%2%2Hf]W(`cfcYh\UbY` f⊯[#@L	%a(!8]clUbY fษ[#@L	%2%48]WN`cfcYN\YbY` f⊯[#@L	W]g!%ã&!8]WI`cfcYh\YbY` f⊯[#@L	%2%2&2Hf]W(`cfcYh\UbY` f⊯[#@2_	%2%48]WN`cfcYN\UbY` ft≝[#@L
UWFÁÔ ^æ),ĭ]/Ê^ç^ Å <sup>®</sup>		Í	G€€	Ē	Î	Ï€	Н	Ï€
T ÖP <i>Í</i> PÜŠÂ <sup>®</sup>		Ē	Ē	F	Ē	Ē	Ē	Ē
€HWÌ FF	Î₽F€ED9€FJ	ŁÆÈ€ÁV	ŁÆÈ€ÁN	FFÈH	ŁÆRÈ€ÁW	ŁÆĖ€Á₩	ŁÆĖ€ÁV	ŁÆÈ€Á₩
€IRÌCG	Î⊞F€BD€€FJ	FÈH	ŁÆRÈ€ÁN	€ĽÍF	€ĒÌÍÁR	FÈ	ŁÆRÈ€ÁV	FÈG
€RÌIÏ	Î∰FEBD€EFJ	ÍI€	HÈ	ĤÈ	Ğ	ÍÈH	ŁÆĖ€ÁV	GÍ
€IRÌIJ	Î₽F€ED€€FJ	FÈ	€ËJÁR	€ÌH	€ÈÌÁR	ŁÆRĒ€ÁN	ŁÆĖ€ÁV	€ĽĚ€ÁR
€WÌHJ	Î∰FEBD€EFJ	ΙH	€ÌÈHÁR	ΙË	HÈ	FË	ŁÆĖ€ÁV	GÌÌ
€WÌÍ	Î∰FEBD€EFJ	ΙĚ	ŁÆRÈ€ÁW	GÈ	€ÌĤÂR	ŁÆRÈ€ÁN	ŁÆĖ€ÁV	€ÈHGÁR
€WÌÏF	Î₽F€ED9€FJ	GF	€ÌÉ€ÁR	HÈ	FÈ	HÈH	ŁÆĖ€ÁV	GÌH
€WÌÏG	Î₽F€ED9€FJ	ÍÈ	ŁÆÈ€ÁN	€ÈG	€ÈLIÁR	€ĽÍÍÁR	ŁÆĖ€ÁV	€ĒÌÎÁR
€WÌÏÏ	Î₽F€ED9€FJ	€ĽÍ GÁR	ŁÆÈ€ÁN	€ÈÌ	ŁÆRÈ€ÁW	ŁÆĖ€Á₩	ŁÆĖ€ÁV	€ÌÈHÁR
€WÌÏJ	Î∰FEBD€EFJ	JÈ	ŁÆÈ€ÁN	€È	€ÈÏÁR	ŁÆĖ€Á₩	ŁÆĖ€ÁV	€ÈÈGÁR

#### :cchbch¥g.

æÈV@^&\^æj`]Á^ç^\Á{¦ÁUWFÁÖ¦[`}å,æ\*\Áa-Á¦{ Á,æ\*^ÁFÌÁ;ÁUWFÁÜ^&[¦áÁ;ÁÖ^&æiã]}ÈÕ¦æiÁ @eaåð;\*Á9;å8&æ\*•Áv&&^åæi&vÁ;Áœ/ÁQ^&)]Á^ç^\È àÈÆP[ÁUWFÁ&\^æj`]Á^ç^\Á@ea-Áa^}A^}A^;A\*•œaà)ār@àÁ{¦ÁFÊEäã;¢æ}^ÉXQ[¦Á^-^!^}&^ÉX@eAT3}}^•[œ#Ö^]æi([^}œfA;AP^a¢@ÁQTÖPDÆ^æ¢@ÁUã\ÁŠã[ãÁQPÜŠDÁ{¦ÁFÊEäã;¢æ}^ÁsÁA;ABEÄO;æiÁ;œáð;\*Á 3;å8ææ\*•Áv&^^åæ)&XÁ-Áv@Æ?ÜŠÈ

#### 5 Wichma gʻUbX`5 VVfYj]Uhjcbg.

#### HUV`Y'' !' ; fcid`%z8z'' z) zUbX`\*`AUbb!?YbXU```GiaaUrmizcf`CI% :M8\$%`5bbiU`FYdcfh Hk]b`7]h]Yg`5fami5aaib]h]cbg`D`Ubh 5fXYb`<]``gzA]bbYgchU



; fci d	G.J.ſ.I A	D'JƯi Y	F <sup>&amp;</sup> JƯi Y	:fUW]jcb`cZ 8YhYW]jcbg	FYgi`hgʻHfYbX	H\ fYg\ c`X`Hf][ [ YfYX3	7 ca a Ybhg
;fcid`&`KY`g.							
I€IÍIJ	FÌ	€Ì€€H	€ÌÍI	Ϊ Á5Â	0&'^æ å *	Ÿ^●	$ P^{ab}A  = \{ A_{k}^{k} \} e^{\frac{1}{2}} A_{k}^{k} = \{ A_{k}^{k} = $
I€JÍÍÏ	FJ	€È€€FI	€ÈÛ	Ϊ ÁĐÂ	Q&¦^æā*	Ÿ^∙	$\dot{O}_{c} \wedge \dot{A} [ c @BA[ c @A] ] \langle \dot{A} B a a a a a a a a a a a a a a a a a a $
€HŠÎÏH	ËFÌ	€È€€H	€ÈFI	Ϊ ÁÐÂ	Ö^&¦^æ ã *	jq	
€HŠÌHH	ËFH	€È€HÍ€	€ÈÌÍ	Ϊ ÁÐÂ	Ö^&¦^æå*	]4	
€HŠÌIÌ	Ë	€È€€ÍI	€ËÏÎ	ΪÁΘÂ	Ö^&¦^æaã_*	ļ	
€HŠÌÍJ	ËFÏ	€È€€Í I	€ÈÍI	ΪÁΒÂ	Ö^&¦^æ å*	]4	
€HMÎÏÏ	ÞŒ	ÞŒ	ÞŒ	€ÁÐÁJ	ÞŒ	]4	ŒĮÁ₽Ö
€HWÌ€Í	FÍ	€È€FÍ€	€ĚÌ€	Ϊ ÁÐÂ	0,&¦^æa∄*	Ϋ́^∙	
€WÎÏH	Ë	€ÈFJ€	€Ì€€FÍÍ	ΪÁÐÂ	Þ[ÁÛðî}ã&aæ)oÁ/¦^}å	Ÿ^∙	Þ^ælÁ[č@gl, `{^Á&^}&^\Ê, `{^Á@se^åÁ ã@g^
€IWÌGF	ËFF	€ÈÉÎÌ€	€ÈGH	ΪÁÐÂ	Ú¦[àæà ^ÁÖ^&¦^æ∙ậ/*	Þ[	
€IWÌHG	ËG	€ÈIH€	€È€€HÎI	ΪÁÐÂ	Þ[ÁÛðî}ã&aæ)oÁ/¦^}å	Ÿ^∙	Ü^ æaãç^ ^Ávcæà ^ÉÁà^ç_^}}ÁiÎ Áæ) åÁÎÎÁu* EŠÁA ãj&^ÁG€€Ë
€IWÌHH	ËGG	€È€€GÌ	€ÈĒ	ìÁGÁ	Ö^&¦^æ•ậ*	Þ[	
€IWÌIF	Ë	€È€GÍ€	€ĚÌÍ	ΪÁÐÂ	Ö^&¦^æ•ậ*	Þ[	
€IWÌIH	G€	Ł€È€€F	ÌÎÉ€	ΪÁÐÂ	Ø,&¦^æ•∄*	Ÿ^∙	Þ^æÅ `{ ^Á&^}&'
€IWÌIÍ	ËFG	€ÈÉÍ FÍ	€ÈFÏ	ΪÁÐÂ	Ú¦[àæà ^ÁÖ^&¦^æ≉āj*	Þ[	
€IWÌIÎ	G€	Ł€È€€F	€ÈIG	ΪÁÐÂ	Q\&¦^ærāj*	Ÿ^∙	Þ^ækÁ, ĭ{ ^Á&^}♂\¦Ék@eniq[¦ä&æk‡ î Án¦¦ææä&
€IWÌIJ							Ù^^ÁÕ¦[ĭ]ÂÎÁĭ{{æ;îÈ
€WÌÍI	ËÎ	€È€F€G	€ËHÌ	ΪÁÐÂ	Ö^&¦^æ•ậ∗	Þ[	
€IWÌÍJ	ËG€	Ł€È€€F	€ÈLJF	ΪÁÐÂ	Ö^&¦^æ•ậ∗	Þ[	
€IWÌÎFÁÇæàæ)å[}^åD	FF	€È€CÌ€	€ËÍG	ÎÁBÂÂ	ÞŒ	ÞŒ	OBaæ)å[}^åÁeee∿¦ÁGE€ÎÁræ{] ^ÊB\$jÁ¤^, ÁÓ¦ãt@{{}ÄÖ^ç^ []{^}c
€WÌÏÍ	ËÎ	€ÈEHF€	€ÈGJJ	I ÁÐÁ	Ö^&¦^æ∙ậ∗	Þ[	
€WÌÏ	ËJ	€ÈÈÌÍ€	€ÈÉÍJI	FÍÁÐÁFÍ	Þ[ÁÛðî}ã&æð)oÁV¦^}å	Ÿ^∙	U}Á^`æeoÁjl`{^Áa[`}åæl^ÉÁæ;Ád^}åÁas^&\^æðj*
€WÌÏJ	GH	€È€GH€	€ÌĤÌ	ÎÁDÁF€	Q&\^æ}	Ÿ^∙	Ő^}^\æ  ^Áşi&\^æeāj*Á-āj&^ÁO€FÍÉba∧ç^^}Å+ĚÉ Áæ)åÁO€Áµ*+ĔŠ
GeÎÎÌÌ	Ë	€ÈGIÌ€	€È€Ë	ÎÁBÂ	Þ[ÁÛðî}ã&Bæ);oÁ/¦^}å	Ÿ^∙	Ü^ æeãç^ ^Árcæà ^ÊÉà^ç ^^}ÁJÈEÁæ)åÁFHÈEÁµ*EŠSÁAj3,&^ÁFJJI
; fci d'%BD	Ë	€ÈGÌF	€È€JÏF	Ï ÁÐÄ	Þ[ÁĴðī}ãã&æ)oÁ/¦^}å	Ÿ^∙	
;fcid`%GD	€	€ĚÎH	G€F€	Ï ÁÐÄ	Úœà/^	Ÿ^∙	
; fci d''	ËF€	€È€JHÍ	€ÌHÍ	ÏÁÐÄ	Ú¦[àæà ^ÁÖ^&¦^ærðj*	Þ[	
; fci d')	FF	€È€ÎÌ	€ÈÎH	ÏÁÐÄ	Ú¦[àæà ^ÁQ,&¦^æeā);*	Ÿ^∙	
; fcid`)`Ib]h'`KY`g.							
I€Jİİ€	Ë	€ÉCH΀	ۃIG	ÎADÂ	Þ[ÁÚðî}ãa38æ); óÁ/¦^}å	Ÿ^∙	Üæ, Ásl^}å/æi/&sl^æ;ð;*
l€JIJÏÁÇanàaa)å[}^åD	ËFF	€ÉECi€	€Ė€J	Ï ÁÐÄ	ÞŒ	ÞŒ	CEaæ) å[}^å/&i`^Å([Å&[]•d ËACEe^\¦ÅOE€ĨÅ æ{] ā]*
l€JÍJĨÁÇæàæ)å[}^åD	Ĥ	€É€G€	€ËHH	ÎABÂ	ÞŒ	ÞŒ	OEaæ); å[}^å/åi`^Å{[/&[]•d E0Eer¦ÅO∈€ĨÅ;æ{] ā];*
€HWIHFÄÇæàæ)å[}^åD	J	€ÉEÏÍ€	€Ė€İ	GADĂ	ÞŒ	ÞŒ	OEaæ);å[}^åA\$u <sup>*</sup> ^Å{[Å\$[}•dEb0Ee∿¦ÅOE€ĨÅæ{] ā];*
€HWI GF	EFJ	€E€€FI	€ÐIF	IABA.	O^&¦^æậ*	Þ[	
€HWI GG	G	€EEIH€	€EEGIJ	I ABA	Þ[AUðā}ãa&aa)oAV¦^}å	<u>۲</u> ^•	O^ç^^}AFG€Aæ)åAFI€Aµ*ESAAjā&^AG€€H
€HSI GG	EFI	€ÆGI€	€⊞J	I ABA	O^&\^æ ĝ *	Þ[	
€HSI€J	Ë	€Éİİ€	€ĖJJ	ÏADAŇ	Þ[ÁÜðľ}ãa&aa)oÁ/¦^}å	Ÿ^∙	lUæ;Ad^}åAãrAå^&¦^ærāj*

Þ[c^•Áæ)åÁ0Eaà¦^çãæeã[}•Á[}ÁÚæ\*^ÁGÈ

#### HUV`Y" !' ; fcid`%z&z" ž)žUbX'\* `A Ubb!? YbXU``Gia a UfmiZcf`CI % : MT&\$% `5 bbiU`F Ydcfh Hk]b`7]h]Yg`5 fam5aaib]h]cbg`D`Ubh 5 fXYb`<]``gz`A]bbYgchU





; fci d	GʻJƯi Y	D'JƯi Y	F <sup>&amp;</sup> JƯi Y	:fUW¶jcb`cZ 8YhYW¶jcbg	FYgi `lgʻHfYbX	<u>H\ fYg\ c`X'Hf][ [ YfYX3</u>	7 ca a Ybłg		
; fci d'* 'Cl %>cfXUb'K Y``g.									
€ RÌ GG	ËFG	€ÈÈÌJ€	€ÈĤÎI	ìÁÐÁ	Ö^&¦^æ•ậ,*	Þ[			
€RÌH	ËÎ	€È€F€G	€Ë€G	I ÁÐÁ	Ö^&¦^æ•ậ,*	Þ[			
€RÌHÎ	FÌ	€ÈEF΀	€ËÌH	ìÁÐÁ	Q&¦^æ₿*	Ÿ^∙	Ô [•^Á;¦[¢ā;āĉÁ;(Á≂ÓÔÕÜÙÁ;^  •É4jã^ ^Á;;+,`^}&^åÁs`Á;@cå[;}		
€RÌHÌ	FH	€ÈEHÍ€	€Ë€€	ΪÁÐÂ	Q&¦^æ₿*	Ÿ^∙	Ô [•^Á;\:[¢ā[āĉ Áş[Á¤ÓÔÕÜÙÁ;^  •Ê4jǎ^ ^Áşi,- ǐ`^}&^àÁà^Á:@cå[;}		
€RÌHÏ	Ë	€ÈÎ J€	€ÈGJI	ìÁGÁ	Þ[ÁÛðî}ã&æð)oÁ/¦^}å	Ÿ^∙	Ô [•^Á;\:[¢ā[āĉ Áş[Á¤ÓÔÕÜÙÁ;^  •Ê4jǎ^ ^Áşi,- ǐ`^}&^àÁà^Á:@cå[;}		
€RÌHJ	€	€ĚIÌ€	€È€H	ìÁGÁ	Ùœà ^	Ÿ^∙	Ó^ [, Á Áµ*EŠÁ		
€RÌIÏ	ËÎ	€È€FFI	€ÈHCG	FJÁÐÁFJ	Ö^&¦^æ•ậ,*	Þ[	Þ^æÁ, ǐ{ ^Á&^}&\		
€RÌIJ	îì	€È€€GÍ	€È€JG	ìÁBÁFÈ	Q&¦^æ₿*	Ÿ^∙	Ó^∥[,ÁFÁµ*EŠÁ		
€IRÌÌG	ΪÍ	Ł€È€€F	€ĚÌÏ€	FÏÁBÁFÏ	Ö^&¦^æ•ậ*	Þ[	ОЩÁ <sup>©</sup> Ö		
€IR€ÏÏ	Ëĺ	€È€È€	€ÈĤI	FIÁBÁFI	Ö^&¦^æ•ậ,*	Þ[			
€IRÏ€G	ËÌ	€È€€H	€ĽÍJÍ	ΪÁÐÂ	Ö^&¦^æ•ậ*	Þ[			
€ RÏ €Ì	FH	€È€HÍ€	€ĚÎÍ	ΪÁÐÂ	\$\%\^æ}}*	Ÿ^∙	Ù[čo@?¦}Á?å*^Áį,-Á,[¦c@4j, `{^Êj, `{^Á @ãe?åÁ ã*@4^		
€IRÏ FH	ÞŒ	ÞŒ	ÞŒ	€ÁÐÄ	ÞŒ	Þ[	ОЩÁ ÞÖ		
;fcid`*`BYghYX`Ib]h(`	K Y`g.								
€IWEÏÏ	ËΙ	€È€€ÍÏ	€ÈH€Í	ÏÁÐÁFI	Ö^&¦^æ•ậ*	Þ[			
€IWÏ€G	ËG	€ÈIH€	€È€€€€HG	Ϊ ÁÐÂ	Þ[ÁÛðî}ã&æð)oÁ/¦^}å	Ÿ^∙	Ó^∥[, ÁHÁµ*HŠÁ		
€Wi€ì	ËÎ	€È€F€G	€ËŒ	I ÁÐÁ	Ö^&¦^æ•ậ∗	]d			
€I WÏ FH	ËFF	€ÈÉÎÌ€	€ÌHÍ€	ÍÁÐÁ	Ú¦[àæà ^ÁÖ^&¦^ærðj*	]d			
€WÌHI	ËC€	Ł€È€€F	€ÈÎJ	ÍÁÐÁ	Ö^&¦^æ•ậ∗	]d			
€WÌHÎ	F	€Ě€€€	€È€FFÏ	ìÁĐÁ	Þ[ÁÛðî}ã&æð;oÁ/¦^}å	Ÿ^∙	Ô [•^Á;¦[¢ā;āĉÁ;[Á=>ÓÔÕÜÙÁ;^  •Ê4ā^ ^Á;;+]`^}&^à/àî^Á@cå[;}		
€WÌHÏ	Ë	€ÈFÏ€	€ÈHÍÏ	ìÁÐÁ	Þ[ÁÛðî}ã&&æ)oÁ/¦^}å	Ÿ^∙	Üæç Ásl^}åÆsiÁsa^&sl^æeāj*		
€WÌHÌ	€	€ĚÎH€	€ÈĤÏI	Ϊ ÁÐÂ	∖lœè	Ÿ^∙	Ó^∥[, ÁHÁµ* EŠÁ ∄ &^ÁG€€J		
€IWÌHJ	HG	€È€€FÏ	€ËJH	F€ËJ&c	Q&¦^æ₿*	Ÿ^∙	Ô [•^Á,¦[¢ã;ã:Á;Á;ÓÔÕÜÙÁ,^  •Ê4ã,^ ^Á;,+`^}&^å,\á`Á;@cå[,}		
€IWÌIÏ	Ĕ	€ÈCÌF€	€ÈEJGH	ΪÁÐÂ	Þ[ÁÛðî}ãã&æ);oÁ/¦^}å	Ϋ́^∙	Üæ;Ád∖^}åÁáá∧&¦∧æ•ā;*		
€IWÌIJ	FG	€ÈÉÍFÍ	€ËÌF	ΪÁÐÂ	Ú¦[àæà ^Á0,&¦^ærā);*	Ϋ́^∙	Þ^æÁ, ǐ{ ^Á&^}♂\¦Ê&e‡] ^æ•Á^ æãç^ ^Á.œàa ^Á.ậ.&^ÁO€FF		
€IWÌÌG	Ë€	€È€JHÍ	€ÈH	ÎÁBÂ	Ú¦[àæà ˆÁÖ^&¦^ærðj*	Þ[			

;YbYfU`BchYg.

Ü^•][}•^Á/@^•@{|åÁċã\*^¦•Áċċ^Áå^-ą}^åÁ§Á/æà|^ÁÖÈÈÈÈÈ

#### 5 WichmagʻUbX`5 VVfYj]Uhjchg.

$$\label{eq:posterior} \begin{split} & \models OEM(A) \left[ \ oAse_{A} \right] \left[ aBaeaa_{A} \right] \wedge LAs(A) \left[ aAse_{A} \right] \otimes Ase_{A} \left[ \ oA_{A} \right] \wedge \left[ A_{A$$

ÞÖÁMÁ,[}Ëå^ơ∿&c

ÞÓÔÖÜÜÁMA⊳^, ÁÓłāł@{}}ÁÔ[}œzęlājæe∿åÃÖ![ĭ}å,æe∿¦ÁÜ^&[ç^¦^ÁÛ\*•e∿{ ÚÁkæ;∿ÁMÁ^]}^••^}o:Á}o:Á}8^\cæajćÁşiÁ@Ás/}å

 $\ddot{U}^{GA}Xad^{*} \wedge \dot{A}M\dot{A}^{*} | \wedge \bullet \wedge \} \circ \dot{A}s@ \dot{A}sad^{*} + \dot{A}s@ \dot{A}sadad^{*} \dot{A}s@ \dot{A}^{*} | \wedge \bullet \bullet \tilde{a} \}$ 

ÙÁxæ;\*^ÁMánjåä&ææ\*•Ánj&k,^æa;1;\*Á0;[•ääā;^ÁÜDá;¦Æs^&;^æa;1;\*Á0;^\*æaā;^ÁÜDá;!^}å

µ\*EŠÁWÁ(a&¦[\*¦æ{•Á,^¦Áãc^¦

#### HUV`Y`\*!% GiaaUfmcZG]hY`5`G\U`ck`; fcibXkUhYf`Acb]hcf]b[`FYei]fYaYbhg :M&\$%`5bbiU`FYdcfh Hk]b'7]h]Yg`5fam5aaib]h]cbg`D`Ubh 5fXYb`<]``gžA]bbYgchU



F Ya YXm7 ca dcbYbh	Acb]hcf]b[ˈFYei]fYaYbhg	=ad`YaYbh]b[ DUfhn	8 cWiaYbhgʻ7 cbhU]b]b[ʻh\Y A cb]hcf]b[ʻD`Ub
ÀFK Õ¦[ĭ}å,,æev\ÁT[}ãa[¦ā);*	æÈ Uĭdậ,∧å,Áà,∧∥		
ÀGK Ô[}œæäj{^}oÁæ)åÁTæ∙ÁÜ^{[çæ‡	adžÁ Þ[}^ÈÁv@^Át¦[`}å, æc*¦Áv¢dæ&cāţ}Á • ^ • cv{ Á, æ•Á @ c4å[, }Á§jÁÙ^] cv{ à^¦Á G∈€Ì Áqeļ[, ā]*Áξ[]  ^{ ^} cæaāt] Ágt – Á T[}ãat[¦^åÁÞæc*¦æ¢ÁQEcv}`æaāt] Ágt ÞOEDÁgt à^Ávçæ¢ੱæc*åÈÁQÁæc×ÁGEFÍÊAT ÞOEÁ æ•Á å^^{ ca4ýæð}Áæ&&^] cæat ^Á^{ ^å^Ê&æð}åÁæÁ Ü^&[¦åÁt, ÁÖ^&ãrāt]}Áæt{ ^}å{ ^}cÁ æt]] [ç^åÁsJÁOŸÁGEFÌÈ		
ÀHOEK Šæ);åÁ∿≬^ÁÔ[}d[ •	aÈ Þ[}^		
$\dot{A}HOK  OHe^{} \ arc^{} \ arc^{} \dot{A} \ $	Ù^^ÁU]^¦aaà ^ÁW}ão/∓ÊÄÜ^{ ^å^Á Ô[{][}^}o/AFÁ;@3&@Áa‡+•[Á5]& ĭå^•Ás@∘Á aa4^aa4)[¦c@4∱,~ÁÙãc^ÁCE		
ÀIK Öãr&@zet*^A[,-ÁÔ¢d:æ&c∿åÁYæe∿¦	aeÈ Þ[}^Áç∮^^ÁÀGÁæà[ç^D		
ÀÍK Ù[ĭ¦&∿ÁÔ@eelæ&ec∿¦ãæeaậ}}ÁaÁÜ^{^åãeeaậi}}	æÈ Þ[}^Èåş[ æa‡á^Áş¦*æ), 38ん&[{][`}åË &[}cæ;ā]æa≊^åÁ[[↕Áā), Ás@A{[`¦&^Áas^2∞á QFJIÍÁ/¦^}&@DA\$, ^¦^Ár¢&æaçæaz^åÁæ), åÁ dæ),•][¦c∿åÁq[Áæ4j,^¦{ãac^åÁ,⊶eãc^Á åã][•æ‡Áæa&ājãcíÁaj, Áo?∀ÁG€€1–È		
UÜK Uç^¦æ‡ ÁÜ^{ ^å^ÁÇCEccæa∄{ ^}ơ4(, ~ÁÔ ^æ)`]ÁÕ[憕[	æÈ Yæe∿¦Á 迢áč Ásiææækó@[č*@;čkô@ Áùãe∿ÁOz ] č{^Ás[Á∿çæ)řæe∿Áseccænā}{^}o%ea)åÁs[Á ç^¦ã f Ás@eækA>æc覿¢AOcccv}čæaā]}ÁsārÁ æså^č æc∿ ŕÁs[]d[  ā]*Áş č{^Ás[āk]æaā]}È	\ Œ{ ^	Ùãe^ÁOEÁT[}ãi[¦ā]*ÁÚ æ),Á§JÁo@∘Á O5]}过ÁÚ^¦-{¦{æ),&^ÁÜ^][¦c

#### HUV`Y`\*!& G]hY`5`; fcibXkUhYf`EiU]hm8UHU :M&\$%`5bbiU`FYdcfh Hk]b'7]h]Yg`5fam5aaib]h]cbg`D`Ubh 5fXYb`<]``gžA]bbYgcHJ



a joint venture

GUad`Y' @cWUhjcb	8 UhY	HYHFUW(`cfcYh\YbY' i[#@	Hf]W(`cfcYh\YbY' i[#@	%ã(!8]clUbY i[#@	W]g!%æ&! 8]W(`cfcYh\YbY`i[#@	%2%48]W¥`cfcYh\YbY` i[#@	%26&!8]W(`cfcYh\UbY" i[#@	7 \ `cfc2cfa ` i[#@	6 YbnYbY i [ #@	5 bh]a cbm i [#@
Ùãe^Á0E∕Ô ^æ),č]Â	ĕ^ç^∣Æ	Ï	H€	Ē	Ï€	Î	I	΀	F€	Î
T ÖP ÁP ÜŠ <sup>A</sup>		Ē	Ē	F	ΗË	Ē	Ē	ΕË	ΗË	Ē
€FW€HJ	ÎÐİBĐ€EFJ	ŁÆRÈ€ÁW	ŁÆRÈ€Á₩	ÞŒ	ŁÆRÈ€ÁW	ŁÁFÈ€ÁV	ŁÆRÈ€ÁW	ŁÁFÈ€ÁW	ŁÁFÈ€ÁV	ÞŒ
€FWF€G	ÎÐİBĐ€€FJ	ŁÆRÈ€ÁW	ŁÆRÈ€Á₩	ÞŒ	ŁÆRÈ€ÁW	ŁÁFÈ€ÁV	ŁÆRÈ€ÁW	ŁÁFÈ€ÁW	ŁÁFÈ€ÁV	ÞŒ
€FWF€H	ÎÐİBĐ€€FJ	ŁÁFÈ€ÁV	ŁÁFÈ€ÁW	ÞŒ	ŁÆRÈ€ÁW	ŁÁFÈ€ÁW	ŁÁFÈ€ÁW	ŁÁFÈ€ÁW	ŁÁFÈ€ÁW	ΗĒ
€FWFFÍ	ÎÐİBĐ€EFJ	ŁÆÈ€ÁV	ŁÆÈ€Á₩	ÞŒ	ŁÆÈ€ÁV	ŁÁFÈ€ÁV	ŁÆÈ€ÁV	ŁÁFÈ€ÁV	ŁÁFÈ€ÁV	ÞŒ
€FWFFÎ	ÎÐİBĐ€€FJ	ŁÆÈ€ÁV	ŁÆRÈ€ÁW	ÞŒ	ŁÆÈ€ÁV	ŁÁFÈ€ÁW	ŁÆÈ€ÁV	ŁÁFÈ€ÁV	ŁÁFÈ€ÁV	ÞŒ
€FWFFÏ	ÎÐÎBĐ€EFJ	HÈ	ŁÆÈ€Á₩	ÞŒ	Ĥ	ŁÁFÈ€ÁW	ŁÆÈ€ÁV	ŁÁFÈ€ÁW	ŁÁFÈ€ÁW	ÞŒ
€FWFGÎ	ÎÐİBG€FJ	ŁÆÈ€ÁW	ŁÆÈ€Á₩	ÞŒ	ŁÆRÈ€ÁW	ŁÁFÈ€ÁV	ŁÆÈ€ÁW	ŁÁFÈ€ÁW	ŁÁFÈ€ÁW	ÞŒ
€FWFHÌ	ÎÐİBG€FJ	ŁÆÈ€ÁV	ŁÆÈ€Á₩	ÞŒ	ŁÆÈ€ÁV	ŁÁFÈ€ÁV	ŁÆÈ€ÁV	ŁÁFÈ€ÁW	ŁÁFÈ€ÁV	ÞŒ
€FWFHJ	ÎÐİBB€FJ	ŁÁFÈ€ÁV	€ÌĤÁR	ÞŒ	FÌ€	€Ë€ÂR	ŁÆÈ€ÁV	ŁÁFÈ€ÁW	FÈG	ÞŒ
€FWFI€	ÎÐİBG€FJ	ŁÆÈ€ÁV	ŁÆRÈ€ÁW	ÞŒ	€ĽĨ€ÁR	ŁÁFÈ€ÁW	ŁÆÈ€ÁV	ŁÁFÈ€ÁV	ŁÁFÈ€ÁV	ÞŒ
€FWFÍÏ	ÎÐİBG€FJ	ŁÆRÈ€ÁW	ŁÆRÈ€Á₩	ÞŒ	€ÈLIÁR	ŁÁFÈ€ÁV	ŁÆRÈ€ÁW	ŁÁFÈ€ÁW	ŁÁFÈ€ÁV	ÞŒ
€FWFÍÌ	ÎÐİBG€FJ	ŁÆÈ€ÁW	€ÌHÁR	ÞŒ	ÍÍ	ŁÁFÈ€ÁW	ŁÆÈ€ÁW	ŁÁFÈ€ÁW	€ÈËGÁR	ÞŒ
€FWHÍ€Å <sup>®</sup>	ÎÐİBĐ€EFJ	€ÈÏÁR	ŁÁFÈ€ÁW	ÞŒ	ŁÁFÈ€ÁW	ŁÁFÈ€ÁW	ŁÁFÈ€ÁW	ŁÁFÈ€ÁW	ŁÁFÈ€ÁW	ÞŒ
€FWHÍ GÂ	ÎÐİBĐ€EFJ	ŁÁFÈ€ÁV	ŁÁFÈ€ÁW	ÞŒ	ŁÁFÈ€ÁW	ŁÁFÈ€ÁW	ŁÁFÈ€ÁW	ŁÁFÈ€ÁW	ŁÁFÈ€ÁW	ÞŒ
€FWHÍHÂ	ÎÐİBĐ€€FJ	ŁÁFÈ€ÁV	ŁÁFÈ€ÁW	ÞŒ	€ÈÌFÁR	ŁÁFÈ€ÁW	ŁÁFÈ€ÁW	ŁÁFÈ€ÁW	ŁÁFÈ€ÁW	ÞŒ
€FWHÍÍÂ	ÎÐİBЀEFJ	ŁÁFÈ€ÁV	€ÈFÆ	ÞŒ	FÈ	ŁÁFÈ€ÁV	ŁÁFÈ€ÁW	ŁÆRĚ€ÁW	ŁÁFÈ€ÁW	ÞŒ
€FWHÍÎÂ	ÎÐİBĐ€EFJ	ŁÆRÈ€ÁW	ŁÆRÈ€ÁW	ÞŒ	FĚ	ŁÆRÈ€ÁW	ŁÆRÈ€ÁW	ŁÁFÈ€ÁV	ŁÁFÈ€ÁV	ÞŒ
€FWHÍÏÂ	ÎÐİBĐ€EFJ	ŁÆÈ€ÁW	ŁÆÈ€ÁW	ÞŒ	ŁÆÈ€ÁW	ŁÆÈEÁV	ŁÆÈ€ÁW	ŁÁFÈ€ÁW	ŁÁFÈ€ÁW	ÞŒ
€FWHÍÌÂ	ÎÐÍЀEFJ	ŁÁFÈ€ÁV	ŁÁFÈ€ÁV	ÞŒ	ŁÁFÈ€ÁV	ŁÁFÈ€ÁV	ŁÁFÈ€ÁV	ŁÁFÈ€ÁW	ŁÁFÈ€ÁW	ÞŒ

Þ[c^•Áæ)åÁOEaà¦^çãæeāį}•Á(}ÁÚæ\*^ÁGÈ

#### HUV`Y`\*!& G]hY`5`; fcibXk UhYf`EiU`]mi8UHU : M'&\$%`5bbiU`FYdcfh Hk]b`7]h]Yg`5fami5aaib]h]cbg`D`Ubh 5fXYb`<]``gžA]bbYgcHJ



a joint venture

GUad`Y` @cWUhjcb	8 UHY	HYHfUW(`cfcYh\YbY' i[#@	Hf]W(`cfcYh\YbY' i[#@	%ã(!8]clUbY i[#@	W]g!%#&! 8]W(`cfcYh\YbY`i[#@	%2%48]WY`cfcYh\YbY` i[#@	%26&18]W(`cfcYh\UbY` i[#@	7∖`cfc2cfa΄ i[#@	6 YbnYbY i [ #@	5 bh]a cbm i [ #@
_Ùãr^Á05ÁÔ ^æ),ĭ] Á	ĕ^ç^∣Æ	Ï	H€	Ē	Ï€	Î	I	΀	F€	Î
T ÖP ÁP ÜŠ <sup>&amp;</sup>		Ē	Ē	F	Ë	Ē	Ë	Ē	ΗË	Ē
€FWJ€F	ÎÐFFBG€EFJ	ŁÆÈ€ÁV	ŁÆÈ€ÁW	ÞŒ	ŁÆÈ€ÁW	ŁÆRÈ€ÁW	ŁÆRÈ€ÁW	ŁÆÈ€ÁW	ŁÁFÈ€ÁV	ÞŒ
€FWJ€G	ÎÐFFEG€EFJ	ŁÆÈ€ÁV	ŁÆÈ€Á₩	ÞŒ	١G	ŁÁFÈ€ÁW	ŁÁFÈ€ÁV	ŁÁFÈ€ÁW	€ÈËJÁR	ŁÁGÈ€ÁW
€FWJ€GÁÇÖč]D	ÎÐFFEG€EFJ	ŁÆÈ€ÁV	ŁÆÈ€Á₩	ÞŒ	IH	ŁÁFÈ€ÁV	ŁÁFÈ€ÁV	ŁÆÈ€ÁW	€ËĽHÁR	ŁÁGÈ€ÁW
€FWJ€H	ÎÐFFEG€EFJ	ŁÆÈ€ÁV	ŁÆÈ€Á₩	ÞŒ	ŁÆÈ€ÁW	ŁÁFÈ€ÁV	ŁÁFÈ€ÁV	ŁÆÈ€ÁW	ŁÁFÈ€ÁV	ÞŒ
€FWJ€I	Î⊕FFBG€FJ	ŁÁFÈ€ÁV	ŁÆRÈ€ÁW	ÞŒ	ŁÆRÈ€ÁW	ŁÆRÈ€ÁW	ŁÆRĚ€ÁW	ŁÁFÈ€ÁW	ŁÁFÈ€ÁW	ŁÁGÈ€ÁW

#### :cchbchYg.

æÈV@^k&\^æ)`] Ár\ç^\ÁL¦ÁÛãx^ÁŒŐL[`}å、æx\f&i Á![{ Á/æà|^ÁF({ Á/æà|^ÁF({ Á/WGÁÜ^8['à/4,00%ã\*ã]}ÈŐ|æ´A`@œå3]\*Á§å&æx•^Ár«&^^åæ)&^Á(A@^&\^æ)`] Ár\ç^\È

åÈÁV@《Á¢dæ&dą}}Á;^||•Áæċ^Á&`||^}q^Á\$jÁ;cæ}åà`ÁQ;[o4;]^\!ææj\*D4;@@?^ÁT[}ǎt;!^å/a/abæč'!æ4/ADEc^}`æætå}ÅQ;t ÞOEDA&As^#A^çæ;\*æ^åÈ

#### 5 Wichmag 'UbX'5 VVfYj]Uhjchg.

ŁÁÝĚYÁWÁWÁse) zeř c^Á, zer Á, [chái^c^&c^å/seai [ç^Ác@ÁT^c@;å/Ö^c^&cai;} ĂŠãį ão/QTÖŠD

Öĭ]ÁMÁåĭ]∣ã&æe^

RÁMÁ^][¦&åÁşæ,¥`∧ÁsiÁs^ç,^^}Á©ATÖŠÁse)åÁs@AÜ^][¦&]\*ÁŠā[ãc ÞOZÁMÁ:æ{]|^Ájæen,Á[oÁse)æ;î:^åÁ{¦Á&[{][`}å ÞÙÁMÁ;[oá-æ{]|^å

UWÁWÁU]^¦æà|^ÁW}ãóÁ

µ\*ЊÁMÁ(a&¦[\*¦æ{•Á,^¦Áãc^¦

#### HUV`Y`+!% GiaaUfmcZG]hY'7`G\U`ck`; fcibXkUhYf`Acb]hcf]b[`FYei]fYaYbhg :M&\$%`5bbiU`FYdcfh Hk]b'7]h]Yg`5fam5aaib]h]cbg`D`Ubh 5fXYb'<]``gžA]bbYgchU



FYa YXm7 ca dcbYbh		A cb]hcf]b[ `F Yei ]f Ya Ybhg		=ad`YaYbhjb[΄ DUfhn	8 cWia Ybhgʻ7 cbhUjbjb[ʻh\YʻA cbjhcfjb[ʻD`Ub
ÀFK	Õ¦[`}å, æe∿¦Áæ)åÁÙĭ¦~æ&∿ÁYæe∿¦/ T[}ãt[¦ā]*	æÈ	Učdậj^å,∕áá∕aí,í		
ÀGK	Õ¦[`}å,æe∿¦ÁÔ[}ææäj{^}c	æ	Þ[}^ÈÁ/@^Á*¦[`}å, ææ^\¦Áv¢dæ&cāţ}Å ●^●c^{ Á, æ●Á@o&a[, }Á\$jÁ¤[ç^{ à^\!Á GEEÌÊÁġ&^Á© Ásc^æ4(, -Á*![`}å, ææ^\!Á 'c@æeA*¢&^^å^åÁs© Á*![`}å, ææ^\'Á& ^æ)`]/  ^ç^ Á[[Á[}*^\¦Áv¢c^}å^åÁ§[Ás© Á ^¢dæ&cāt]}Á, ^  •È	Á	
Àнк	Öãa&@eel*^A[∖-ÁÔ¢clæ&c∿åÁYæe∿¦	æÈ	Þ[}^ÁĢ^^ÁÀGÁæà[ç^D		
ÀΙΚ	Šæ)åÁ•^Á&[}d[ •Á[ÁÜ^•da&oÁ Y^  ÁQ0•cæ) ææ‡[}Áæ)åÁ[ÁÚ¦[c^&oÁ o@ÁÜ^{{^å^ÁQ2+æ•d`&č¦^	æÈ	Þ[}^Ř		
UÜK	Uç^¦æ‡ ÁÜ^{ ^å^ÁÇEncæa∯{ ^}o4(,-Á Ô ^æ),ĭ]ÁÕ[憕D	æÈ	Õ¦[`}å, æe^\¦Á`æ¢aɛ´Ásææækû@[`*@[`@`óÁ c@AÛãe^AÔÁ; `{^A[Áçæ‡`æe^Áxeææa∰{^}o æ}åÁs[Áş^¦ã?Ás@ææ∱]^¦ææã;}Á; ÁxeÁ *'![`}å, æe^\¦Á¢dæ&cã;}Á^•c^{{&s}Á,[oÁ ¦^``ã^àÈAOE•[Á`¦-æ&^Á;æe^\¦Ásæææ\$\$jÁs@A ] `{^Áş&&3;ãc`Ás[Áş^\?ã?Ás@æe4*![`}å, æe^\!/ å[^•Á,[oÆs[]æ&oÁ`¦-æ&^Á;æe^\¦Ásæa[ç^Á •`¦-æ&^Á;æe^\;Ácæa}åæå•È	A OE{^ A	Ùãe^ÁÔÁT[}ãã[¦ãj*ÁÚ æ),Á§jÁo@∘ÁOE;}čæļÁÚ^¦-{¦{æ}}&^Á Ü^][¦c

#### HUV`Y`+!& K UHYf`EiU`]hm8UHU'2cf`G]hY`7`; fcibXkUHYf :M`&\$%`5bbiU`FYdcfh Hk]b`7]h]Yg`5fam5aaib]h]cbg`D`Ubh 5fXYb`<]``gzA]bbYgcHJ



GUa d`Y`@cWUf]cb	8 Uh/"	@/UX`f8]ggc`j YXŁ````` fl <u>e[</u> #@L
Ùã^ÁÔÁÔ ^æ)`] ÁŠ^ç^ Á <sup>#Á</sup>		FÍ
€FW€I Î	ÎÐİBG€FJ	ŁÆRÈ€Á₩
€FWÍÎFÁÇTYËED	ÎÐİBĐ€€FJ	ŁÆRÈ€ÁW
€FWÍÎGÁÇTYËGD	ÎÐİBG€FJ	ŁÆRÈ€ÁV
€FWÍÎHÁÇTYËHD	ÎÐÜEЀEFJ	ŁÆRÈ€ÁW
€FWÍÎIÁÇTYËD	ÎÐÜEЀEFJ	ŁÆRÈ€ÁW
€FWÍÎÏÁÇTYËÏD	ÎÐİBĐ€€FJ	ŁÆRÈ€ÁW
€FWÍÏFÁÇTYËFFD	ÎÐİBĐ€€FJ	ŁÆRÈ€ÁW
€FWÍÏHÁÇTYËFHD	ÎÐİBĐ€€FJ	F΀
€FWÍÏIÁÇTYËFID	ÎÐİBĐ€€FJ	HJ
€FWÍÏIÁÇTYËFIDÁÖWÚ	ÎÐİBĐ€€FJ	€
€FWÍÏÍÁÇTYËFÍD	ÎÐİBG€FJ	ŁÆRÈ€ÁV
€FWÍÏÎÁÇTYËFÎD	ÎÐİBG€FJ	ŁÆRÈ€ÁV

#### ∶cchbch¥g.

æbĚV@/&kl/æ)`]Á/\ç^|Á[¦ÁÙãr/ÁÔÁÕ¦[`}å, ær/¦/árÁ¦[{Á/æà|^ÁrÁ[-ÁUWGÁÜ^&[¦å/á[-ÁÖ^&ãrá[}}ÁŒ[^}å{\_^}å{\_\*}öAFEĂÕ¦æâ/á@æå3]\*Ásjå&&ær/•Á ^¢&^^åæ)&^Á[-Á@A&l/æ)`]Á/\ç^|È

#### 5 Wichmag UbX 5 VVfYj]Uhjcbg.

Öč] Á MÁåč] | ã&æe^

UWÁMÁU]^¦æà|^ÁW}ãóÁ

µ\*ЊÁMÁ, 38⊌[\*¦æ{•Á,^¦Áãc^¦

#### HUV`Y`+!' KUHYf`EiU`]hm8UHUZcf`G]hY`7`GifZUWY`KUHYf :M`&\$%`5bbiU`FYdcfh Hk]b`7]h]Yg`5fam5aaib]h]cbg`D`Ubh 5fXYb`<]``gžA]bbYgcHU



GUad`Y`@cWUhjicb	8 UhY	@/UX`f8 ]ggc`j YXL`````` fle[ #@L
Ù˘¦-æ&^Á⁄ 梦ÁÔ ^æ)˘] ÅŠ^ç^ Å <sup>#Å</sup>		ÎÈ
ÞÒÁ∕ ^qæ <mark>)</mark> å∙	ÎÐÍBĐ€€FJ	ŁÁFÈ€ÁV
ÞÒÁ∕ ^qæ)å∙	ÎÐÎED€€FJ	ŁÁFÈ€ÁV
ÞÒÁ∕ ^qæ)å∙	ÎÐÖED⊖€FJ	ŁÁFÈ€ÁV
ÙY Ĕ	ÎÐÉBƏ€FJ	ŁÁFÈ€ÁV
ÙY Ĕ	ÎÐÎED€€FJ	ŁÁFÈ€ÁV
ÙY Ĕ	ÎÐÖED⊖€FJ	ŁÁFÈ€ÁV
ÙY Ē	ÎÐÉBƏ€FJ	ŁÁFÈ€ÁV
ÙY Ē	ÎÐÎED€FJ	ŁÆRÈ€ÁV
ÙY É	ÎÐİBG€FJ	ŁÆRÈ€ÁV

:cchbch¥g.

æÉV@ Á&\^æj\*] Árç^|ÁL¦ÁÛãr ÁÔÁÙ\*¦æ&r Ár ær\'Ær Á¦[{ Á/æà|^ÁFA[ ÁU WGÁÜ^&[¦å ÁL AÖ^&ãr áL} ÁCE[ ^}å{ ^}ôÅFÉŐ¦æê Á @æå ðJ\*ÁBJå&æer∿A ^¢&^^åæ) &rÁL Á@ Á&\^æ)\*] Árç^|È

#### 5 WichmagʻUbX`5 VVfYj]Uhjchg.

Ö`] ÁMÁå`] |ã&æe^

UWÁWÁU]^¦æà|^ÁW}ãoÁ

µ\*ЊÁMÁ(a&¦[\*¦æ{•Á,^¦Áãc^¦
#### HUV`Y`+!( 7 cbh]b[YbWmi@cWUh]cbg`Zcf`G]hY`7`A cb]hcf]b[ :M&\$%`5 bbiU`FYdcfh Hk]b`7]h]Yg`5fam5aaib]h]cbg`D`Ubh 5fXYb`<]``gžA]bbYgchU



a joint venture

	7 cbh]b[YbWhFc`Y					
GUad`]b[∵@cWUh]jcb	Hf][[Yf`Zcf`7cbh]b[YbWhi5W1]cb <sup>.U</sup>	7 cbh]b[ YbWn5 W]cb				
ТҮЁ	Á∜QÁHE <sup>™</sup> ç^}o4∖[çậ]*Áæç^¦æ*^ÁNÁFÍÁµ*EŠ	Þ[ & Á&				
ΤΥË	ÁKQÁHĖ <sup>A</sup> ç^}œ4([çậ)*Áæç^¦æ*^ÁNÁFÍÁµ*EŠ	Þ[ & Á&				
ΤΥËF	ÁKQÁHE <sup>2</sup> ç^}ơ4([çậ)*Áæç^¦æ*^ÁNÁFÍÁµ*EŠ	Þ[ &Á&				
ΤΥËÊÎ	ÁKQÁHE <sup>2</sup> ç^}ơ4([çậ)*Áæç^¦æ*^ÁNÁFÍÁµ*EŠ	Þ[ &Á&				
€FW€IÎ	Á∜QÁHË^ç^}ơ4([çã)*Áæç^¦æ*^ÁNÂÈDÁµ*ĐŠ	Þ[ & Áa				
ÞÒÁ⁄ ^qæ) åÅ	Á%QAÁ;}^Á;æ{] āj*Á∿ç^}ơANAÂÈIÁµ*EŠ	Þ[ & Áa				
ÙY Í Â	Á%Q4Á;}^Áræ{] ãj*Á∿ç^}ơANAÂÈIÁµ*BŠ	Þ[ & Á				
ÙY Î Â	ÁKQA∱}^Áræ{] ā]*Á∿ç^}ơÁNAÎÈIÁµ*EŠ	Þ[ &Á				

#### :cchbch¥g.

æbĚY æe^\¦Á ĭæ¢ãĉ Á([}ãd[¦ā] \* Áša Á[¦Ásã • [|ç^ å Á[^ æså Ásj Á([}ãd[¦ā] \* Á, ^||• Ása) å Á ĭ¦-æ&∧ Á, æe^\¦È

à ÈÁÙ ˈ¦-æ&^Á, æc^¦Á;æ{]|ā] \* Æ;Á,^¦-{|{ ^å/ţ} Ás@^^/&[} •^&` cãç^Ásaê • Ása) åÁ^ • `|o• Ása^Ásaç^¦æ\* ^åÁ{; ¦&[ } æ;ã[ } ÁtjÁs@ Á dã \* ^¦È

& BÁCEE{^Á}[cã~ÁNÙÒÚCEET ÚÔCEÁ, ãc@a) Á∓Á, ^^\Á¦[{Á^&^ā]; oÁ, ≁åiaacaakaa) å Á`à{ãokaa) Á∿çaa,ĕacaā[}Á^][¦oÁ,ãc@a),Á⊣€Aåacê•Á¦[{Á }[cãa38acaā]}È

å ÈKCE{ ^ Á; [ cã~ ÁNÙ Ò Ú CEET Ú Ô CEÁ; ãc@a) ÁF Á; ^^\ Á'; [ { Á^&^a]; oA; -Á's accead Áb; ãnãeec^Á; [ } c@p` Á ace; ] |āj \* Á; -ÁÙ Y ÉI ÉAÙ Y ÉI ÉA© Á> Ò Á Y ^ qaa) å ÉAca) å Ás@ Á^] |as&^{ ^} oA; ^ qaa) å LÁsa) å Á\* à { ãnÁsa) Á°, çaa; accead áb; ãnœa) Á h= Á's ac 4 I { A, [ cã- ÁNÙ Ò Ú CEET Ú Ô CEÁ; ãnœa) ÁF, à { ãnÁsa) Á°, çaa; accead áb; ãnœa) Á h= Á's ac 4, [ { Á; [ cã-Bacaecead; } È

^ ÈÁDE{ ^ Á, [cã~ Á\\ÙÒÚCEET ÚÔCEÁ, ão@3) ÁFÁ, ^^\ Á¦[{ Á^&^3] cÁ, Á&aæadÁ3) ãããæc^Á; [}c@? Á æ{ ]|ā,\* Á; ÁÙY ÉI ÉÀUY ÉI ÉÀU? ÉI ÉÀU® Á> ÒÁ Y ^ dæ) åÉ&ee) å Áv@ Á^]|æ&^{ ^} cá, ^ dæ) å LÁee) å Á\* à {ão Áee) Á^çæt, æat}}Á^][¦cÁ, ão@3) Á+KEÁ3 æê•Á¦[{ Á,[cãã&æatā]}ÈÁQÂUY ÉI Á ^ ¢&^^ åæ) & & A&[} cā, ^ • Á[¦Á+A&[}•^&`cã;^ Á; [}c@ É&&[}cæat) Áx@ Á\*¦-æ&^Á;æc\*¦ÁeæÂUY ÉI É&d^æafÁ5A,^&^••æ^îD&ee) å Á5aã & @eet\*^Á q[Á æ) ãæa^Á^, ^¦È

#### 5 Wichma gʻUbX`5 VVfYj]Uhjcbg.

$$\label{eq:constraint} \begin{split} T & U \hat{O} CE \hat{H} \hat{I} \} ^{\bullet} [ \ csa \hat{L} [ ||` \ csa \} \hat{A} \hat{O} [ \} d [ | \hat{A} CE ^ \} & \\ W \dot{O} \dot{O} (CE \hat{H} \hat{I} \hat{V}) \hat{a}^{\circ} \hat{a} \hat{A} \hat{U} csa ^ {\bullet} \hat{A} \hat{O} ] \hat{c} \hat{a} [ \} \{ \ ^ \} csa \hat{A} \hat{L} [ \ c \ ^ \& ca \hat{I} \} \hat{A} \hat{C} \hat{E} ^ {\circ} \} & \\ \end{split}$$

#### HUV`Y', '%

## GiaaUfmicZ; fcibXkUhYf`Acb]hcf]b[`FYei]fYaYbhg :]gWU`MYUf`&\$% G]hY`=žCI& 5fXYb`<]``gžA]bbYgchU

F Ya	YXm7 ca dcbYbh	Acb]hcf]b[¨FYei]fYaYbhg	F Ygdcbg]V`Y`DUfIm	8 cWiaYbhgʻ7 cbhUjbjb[ʻh\Yʻ A cbjhcfjb[ʻD`Ub
ÀF	Õ¦[`}å,æe∿¦ÁT[}ã4[¦ā);*	æÈÕ¦[`}å, æe^¦Á`æ‡ãĉÁæ}åÁ, æe^¦Á^ç^ •Á{[Ádæ&\Á ¦^{ ^å^Á,¦[*¦^••	Þ[¦co@[]ÁÕ¦`{{æ}}Á Ù]æ&∿ÁÛ^∙e∿{•	Ùãc^ÁQÁT[}ãt[¦ā]*ÁÚ æ),Á§,ÁO5;}`æ Á Ú^¦-{¦{æ),&^ÁÜ^][¦c
ÀG	Œååããáa;}æ4Á0,ç^∙cã*æaãáa;}	æÈÞ[}^ÁĢ&[{] ^ơ\åD		
ÀH	Šæ);åÁ∿•^ÁÔ[}d[ •	æÈÞ[}^		
UÜ	Uç^¦æ∥ÁÜ^{ ^å^	æÈYæe∿¦ÁĭæpäîÁåææækų[Á∿çæ¢ĭæe∿Áæcæa‡]{^}c	Þ[¦co@[]ÁÕ¦`{{æ})Á Ù]æ&∿ÁÛ^∙c^{•	Ùãe^ÁQÁT[}ãt[¦ā]*ÁÚ æa)Á§JÁO5;}čæļÁ Ú^¦-{¦{æa)&^ÁÜ^][¦c

#### HUV`Y', "&

#### AcghiFYWYbhi; fcibXkUhYfiEiU]hmi8UhUftlMi&\$% Ł G]hYi=žCI& 5fXYbi<]``gžA]bbYgchU

			Vigi%‱a]W`cfcYh YbY		htubg!%ä&i8]W`cfcYh YbY			Hf]W`cfcYh YbY			J]bm`7\`cf]XY
G]hY`=	7`YUbid'@	∕jƳ <sup>ft⁄≰</sup>	+\$ <sup>°</sup> fhcHJŁ				'\$			\$"&\$	
@cWUhjcb	8 UHY	8i d	±[ #@		±[ #@	#@ ±[#@				±[ #@	
€FW€ÎI	IÐBÎÐG€FH		ΙÈG	Ł	FÈ€			€ÈI	RÚ	Ł	FÈ€
€FŴ HG	IÐÐÎÐĐ€FH		ä		€ÌHÍ	RÚ		FŒ		Ł	FÈ€
€FŴ Ĥ	IÐÐÎÐĐ€FH		Ł FÈ€	Ł	FÈ€		Ł	FÈ€		Ł	FÈ€
€FŴÎHJ	l 609. 609€FH		Ł FÈ€	Ł	FÈ€			JĚ		Ł	FÈ€
€FŴÎI€	l 609. 609€FH		Ł FÈ€	Ł	FÈ€		Ł	FÈ€		Ł	FÈ€
<b>Œ</b> FT Y	IÐÐÎÐĐ€FH		Ł FÈ€	Ł	FÈ€			€ÈH	ŔŰ	Ł	FÈ€
ŒGT Y	IÐÐÎÐĐ€FH		Ł FÈ€	Ł	FÈ€			€ĒG	RÚ	Ł	FÈ€
ŒGT Y	IÐÐÎÐĐ€FH	Ö	Ł FÈ€	Ł	FÈ€			€ËÎ	RÚ	Ł	FÈ€
ŒŰTY	IÐÐÎÐĐ€FH		Ł FÈ€	Ł	FÈ€			FÊ		Ł	FÈ€
€FWÎÎÏ	Ì₽FHBG€EFH		Í€€		FÈ			ΙË			H€€

Þ[ c∿∙K

ÖÁ#ÜÄØã∿|å ÁÖč] |ã&æe^

#### HUV`Y'- '%

#### GiaaUfmicZ; fcibXkUhYf'Acb]hcf]b['FYei]fYaYbhg :]gWU'MYUF&\$% G]hY'?žCI& 5fXYb'<]``gžA]bbYgchU

FYa	a YXm7 ca dcbYbh	Acb]hcf]b[ˈFYei]fYaYbhg	F Ygdcbg]V`Y`DUfIm	8 cWia Ybhgʻ7 cbhUjb]b[ʻh\Y` A cb]hcf]b[ʻD`Ub
ÀF	Õ¦[`}å,æe^\¦ÁT[}ãd[¦ā);*	″U`dậ∧åÆa∧∥		
ÀG	Ù^} @}^ <b> Á</b> Y^  <b> </b> ●	æÈYæe∿¦Áĭæ¢ãĉÁq[Á;[}ãq[¦Áj[d∿}cãæ¢Á;ã*¦æaqāj}	Þ[¦co@[]ÁÕ¦`{{æ}}Á Ù]æ&∿ÁÙ^∙c^{•	Ùãe^ÁSÁT[}ãt[¦ā]*ÁÚ aa)Á5jÁ0E;}čaa)Á Ú^¦-{¦{ aa)&^ÁÜ^][¦c
ÀH	P^å¦aĕ ã&ÁÔ[}œæäj{^}c	æÈYææ^¦Á^ç^∣∙ÁĮ¦Á`•^ÁşjÁ妿;āj*Á&[}d[ĭ¦Á;æ]•Á •@[,ā]*Á&æn]č¦^	Þ[¦co@[]ÁÕ¦`{{æ}}Á Ù]æ&∿ÁÙ^∙c^{•	Ùãe^ÁSÁT[}ãt[¦ā]*ÁÚ aa)Á5jÁ0E;}čaa)Á Ú^¦-{¦{aa)&^ÁÜ^][¦c
		àÈÚĭ{]āj*Áç[ ĭ{ ^∙Áæ);åÁæe^•Á{[¦Á^][¦cāj*	Þ[¦co@[]ÁÕ¦`{{æ}}Á Ù]æ&∿ÁÙ^∙c^{•	Ùãe^ÁSÁT[}ãt[¦ā]*ÁÚ aa)Á5jÁ0E;}čaa)Á Ú^¦-{¦{aa)&^ÁÜ^][¦c
ÀI	Õ¦[ĭ}å,æe^\¦Á/¦^æe{ ^}c	″ Þ[}^		
ÀÍ	V¦^æe∿åÁYæe∿¦ÆÖãa&@ee¦*^	″ Þ[}^		
ÀÎ	Öãr&@æe'*^ÁT[}ã[¦ãj*	æÈV¦^æe^åÁ∿~-∤`^}oÁ,æe^¦Á`æ¢ãĉÁ{¦Á&[{]æ÷ãr[}Á{[Á •`à•œa)cãç^Á^``ã^{ ^}o^Á&¦ãe^¦ãæÁ{¦Ååã&&@æ÷^Á {æ¢ã[`{ÁåæãjîÁ&[}&^}dæaā]}	Þ[¦c@[]ÁÕ¦`{{ æ}Á Ù]æ&^ÁÛ^•c^{•	Ùãe^ÁSÁT[}ãt[¦ā]*ÁÚ aa)Á5jÁ0E;}čaa)Á Ú^¦-{¦{ aa)&^ÁÜ^][¦c
ÀÏ	Œâåããáa,}æ¢ÁQ,ç^∙cã ææãáa,}	æÈÞ[}^ÁQ&[{] ^♂åD		

#### HUV`Y'- "&

#### ; fcibXkUhYf`EiU]hm8UhU :]gWU`MYUf`&\$% G]hY`?žCI& 5fXYb`<]``gžA]bbYgchU

		£84	Wgg!%2&ealW`cfc YA Yb Y	Hubg¦‱28]W`cfcYh YbY	Hf]W`cfcYN YbY
G]hY`?	'7`YUbi d'@	′j Ƴ <sup>™⁄¥</sup>	+\$`fHcH	ሆ`879Ł	'\$
@cWUhjcb	8 UHY	8 i d	±[ #@	±[ #@	±[ #@
S€IËTYÁÇÌGEÌHD	ÎEOFEO€FJ		ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á
€FWFĠ	ÎF07=F707€F.IÁ		<i>⊾ i</i> ⊂r≿ci		
	1 Be Bed 6/1		£Ar <b>E</b> €Α	ŁArb€A	ŁA⊨t€A
€FWÎ €H	ΣQEFEQ€EFJÁ		£artea F€Á	ŁArb€A €ĒĽHÁRÚÁ	ŁArt€A GÈCÁ
€FWÎ €H €FWÎ FÍ	Î BOFBO€FJÁ Î BOFBO€FJÁ		EAFBEA F€Á GI€€Á	ŁAĸĿŒA €EÏHÁRÚÁ F€€Á	ŁAFEEA GÈGÁ FJ€€Á
€FŴÎ €H €FŴÎ FÍ €FŴÎ FÍ	Î BOFBOEFJÂ Î BOFBOEFJÂ Î BOFBOEFJÂ	Ö	EARBEA F€Á GI€€Á GH€€Á	ŁArBEA €ĨĽHÁRÚÁ F€€Á FF€Á	ŁAFE€A GÈCÁ FJ€€Á FÌ€€Á
€FŴÎ €H €FŴÎ FÍ €FŴÎ FÍ €FŴÎ FÏ	Î BOFBOEFJÁ Î BOFBOEFJÁ Î BOFBOEFJÁ Î BOFBOEFJÁ	Ö	EARTEA F€Á GI€€ÉÁ GH€€Á HĒĽÁ	ŁArteA €ĨĽHÁRÚÁ F€€Á FF€Á €ĨĽUÁRÚÁ	Ł/kłEA GÈCÁ FJ€€Á FÌ€€Á Ł/krE€Á
€FŴÎ €H €FŴÎ FÍ €FŴÎ FÍ €FŴÎ FÏ €FŴÎ FÌ	Î BOFBOEFJÁ Î BOFBOEFJÁ Î BOFBOEFJÁ Î BOFBOEFJÁ Î BOFBOEFJÁ	Ö	EAREA F€Á GI€€Á GH€€Á HĒĽÁ EĒĽJÁRÚÁ	ŁArteA €ĨĽHÁRÚÁ F€€Á FF€Á €ĨĚIJÁRÚÁ ŁÁRTEÁ	ŁAFBEA GÈCÁ FJ€€Á FÌ€€Á ŁÁFBEA FÈJÁ
€FŴÎ €H €FŴÎ FÍ €FŴÎ FÍ €FŴÎ FÏ €FŴÎ FÌ €FŴÎ GF	Î BOFBOEFJÁ Î BOFBOEFJÁ Î BOFBOEFJÁ Î BOFBOEFJÁ Î BOFBOEFJÁ Î BOFBOEFJÁ	Ö	LAREA F€Á GI€€Á GH€€Á HĒĽÁ EĽĽJÁRÚÁ ŁÁREA	ŁArteA €ĨĽHÁRÚÁ F€€Á FF€Á €ĨĽUÁRÚÁ ŁÁrteÁ ŁÁrteÁ	ŁAFEEA GÈCÁ FJ€€Á FÌ€€Á ŁÁFÈEÁ FÈJÁ ŁÁFÈEÁ

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#### HUV`Y'- "

#### ;fcibXkUhYf'9`YjUh]cb'Acb]hcf]b[ :]gWU'MYUf'&\$% G]hY'?žCI& 5fXYb'<]`gžA]bbYgchU

		;fcibXkUhYf	
	;fcibXkUhYf <sup>·</sup>	9`Yj Uhjcb	;fcibXkUhYf <sup>·</sup>
	9`Yj Uhjcb	fk]ghcf]WU	9`YjUhjcb
KY`` <b>=</b> 8	fb-ibY`&\$%*Ł	AUI]aiaŁ	fbibY`&\$%.Ł
€FW€IÏ	ÌÏHĚÎ	ÌÏİĖÍ	OEaæ))å[}^å
€FW€IÌ	ÌÏHÈÌ	ÌÏÎḖF	ÌÏÍÈÍ
€FW€Í G	ÌÏÍĚ́F	ÌÏÎḖI	ÌÏÎËF
€FW€ÎÍ	OEaæ);å[}^å	ÌÏIÈF	OEaæ);å[}^å
€FWFG	ÌÏIĖ́H	ÌÏÏÈË	ÌÏÎÐ̈́F
€FW΀F	OEaæ);å[}^å		OEaæ);å[}^å
€FŴ΀G	OEaæ);å[}^å		OEaæ);å[}^å
€FŴ΀H	ÌÏÌĖ́I	ÌÌGËÎ	ÌÌFÈ€
€FŴ΀I	OEaæ);å[}^å	ÌÏJËJ	OEaæ);å[}^å
€FŴ΀Í	OEaæ);å[}^å	ÌÏJËF	OEaæ);å[}^å
€FŴ΀Î	ÌÌÌĖÎ	ÌÌÏĖÎ	Öæ{ æ*^^å
€FŴ΀Ì	OEaæ);å[}^å		OEaæ);å[}^å
€FW΀J	OEaæ);å[}^å	ÌÌÎĖ́H	OEaæ);å[}^å
€FŴÎ FF	OEaæ);å[}^å		OEaæ);å[}^å
€FWÎ FG	ÌÏJĒÎ	ÌÌIË€	ÌÌ€ÈÌ
€FŴÎ FH	OEaæ);å[}^å	ÌÌÌÈÉÍ	OEaæ);å[}^å
€FWÎ FÍ	ÌÏÌĚ€	ÌÌHËF	ÌÌGÈIG
€FWÎ FÎ	OEaæ)å[}^å	ÌÌŒËÍ	OEaæ);å[}^å
€FWÎ FÏ	ÌÏÏÊÏ	ÌÌHÈG	ÌÌ€ÈÌ
€FWÎ FÌ	ÌÌFÈÌ	ÌÌÍÉÌ	ÌÌIÈGÍ
€FWÎ FJ	OEaæ);å[}^å	ÌÌÎÊ€	OEaæ);å[}^å
€FWÎG€	OEaæ);å[}^å	ÌÌFÈH	OEaæ);å[}^å
€FWÎ GF	ÌÏÌÈÎ	ÌÌHĒÏ	ÌÌFËÎ
€FWÎ GI Q	OEaæ);å[}^å	ÌÌFËÎ	OEaæ);å[}^å
€FŴÎ GI Ó	OEaæ);å[}^å	ÌÌFËH	OEaæ);å[}^å
€FWÎ GI Ô	OEaæ);å[}^å	ÌÌFÊI	OEaæ);å[}^å
€FŴÎ GI Ô	OEaæ);å[}^å	ÌÌFÉI	OEaæ);å[}^å
€FWÎ GÍ Q	ÌÏÌËG	<u>ìì HÈ</u> Í	ÌÌFÈH
€FWÎGİÓ	ÎÎİË€	ÌÌHĖJ€	ÍÍFÉÍ
€FWÎ GÍ Ô	Uà∙dĭ&c^å	ÌÌÏÈF	Uà∙dĭ&c^å
€FŴÎ Ġĺ Ô	ÌÏÌḖJ	ÌÌHÈF	ÌÌFËÎ
€FŴÎ ĜÎ Œ	ÌÏÌÈGÌ	ÌÌGËÏ	ÌÌFËF
€FWÎ Ĝ Ó	ÌÏÏÐJ	ÌÌHĚ€	İİFİEGİ
€FWÎ Ĝ Ô	ÌÏÌÈEÏ	<u>iihé</u> ì	İİFİEGİ
€FWÎ Ĝ Ö	ÌÏÌÈI	ÌÌHĒF	ÌÌFÈH
€FWÎ GÏ Œ	ÌÏJÈHG	<u>ii GĒ ï</u>	İİGË€
€FWÎ ĠÏ Ó	i i i ÈGH	<u>ÌÌHĚÏ</u>	ÌÌFÈHÏ
€FWÎGÏÔ		<u>iihéî</u>	İİFÈGJ
€FWÎ GÏ Ö	ÌÏÌÈÍ	ÌÌHĒĽÏ	ÌÌFÈH€

#### Úæ\*^ÁGÁ[~ÁH

#### HUV`Y'- "

#### ;fcibXkUhYf'9`YjUh]cb'Acb]hcf]b[ :]gWU'MYUf'&\$% G]hY'?žCI& 5fXYb'<]`gžA]bbYgchU

K Y``=8	;fcibXkUh¥f 9`YjUh]cb f⊳ibY`&\$%% Ł	;fcibXkUHYf <sup>°</sup> 9`YjUH]cb fk]ghcf]WU <sup>°</sup> AUI]aiaŁ	;fcibXkUh¥f 9`YjUh]cb f⊳ibY`&\$%% Ł
€FŴÎ ĜÌ Œ	OEaæ),å[}^å	ÌÌ€ÈU	CEaæ),å[}^å
€FŴ Ġ Ó	OEaæ)å[}^å	ÌÌ€ÈH	OEaæ),å[}^å
€FŴÎ ĠÌ Ô	OEaæ)å[}^å	ÌÌ€ÈÓÍ	CEaæ);å[}^å
€FŴÎ ĠÌ Ö	OEaæ);å[}^å	ÌÌ€EÓÍ	OEaæ);å[}^å
IÌG€ÌÍÁÇS€FTY[	OEaæ);å[}^å	ÌÌÏÈEJ	OEaæ)å[}^å
IÌGEÌIÁÇS€GTY[	OEaæ);å[}^å	ÌÌÏĖ́F	OEaæ))å[}^å
IÌG€ÌHÁÇS€ITY[	ÌÌFÈH	ÌÌÍÈÌ	ÌÌHĒÈÌ
€HŴÎGF	ÌÍÌÈÎ	ÌÍÎËH	ÌÎFÊF

#### Úæ\*^ÁHÁį,~ÁH

#### HUV`Y'- !'

#### ;fcibXkUhhfʻ9`YjUhjcbʻAcb]hcf]b[ :]gWU`MYUf`&\$% G]hhſ?žCI& 5fXYbʻ<]`gžA]bbYgchU

	;fcibXkUhYf		
	9`Yj Uhjcb	;fcibXkUhYf	;fcibXkUhYf <sup>·</sup>
	fk lahcf 1WU	9`Yi Uhicb	9`Yi Uhicb
К.Қ.,.₹	AUllaiaŁ	fbi bY'&\$% Ł	f⊾i bY'&\$% Ł
€FW€LÏ			
€FW€IÌ	ÌÏÎĤĒ	<u> </u>	
€FW€ÍG	<u> </u>		ÌÏÎËF
 €FW€ÎÍ	ÌÏIÀF		
€FWEG			
EFWÎ EF		പ്പാപ്പാപ്പാപ്പാപ്പാപ്പാപ്പാപ്പാപ്പാപ്പ	∩ Gacaàå[\∧å
EFWÎ EG		 Ω5ຄອງຈ[] \∧ ຈໍ	ິດ5ລາລໍລ[ໄ∧ລໍ
EFWÎ EH	ÌÌΩ‡Î		
EFWÎ EI		പ്പും	က်ခဲ့ဆုံခို[\^ခံ
erwî eî		ິດໂຄລາວໍ[ໄ/\ວໍ	ິດໂຄລາວ[] ໄດ້ວ່
erwî eï	ì Ì Ï Ě Î	്ഷ്ഷ്∆ാ് ന്ഷ്ഷ്∆ാ്	ິບ⊿ຜູຊ[ງີຊ ຕິໝູ່ ໝໍ∧∧ໍາ
ਦ ਅੰਦ ਵਾਆਂ ਦੇ		പ്രക്ഷാം പ്രക്ഷാം	ഗകുകാം⊿
e wiel Ewiel			
		പിവലം പ	പ്പം
€FWIF⊓ ÆFWÎEÍ			
	li∩n⊈r ìì∩n≭í	പിവലം	ິດເມື່ອ (1) ວິດເມື່ອ (1)
EFWIFI EFWÎFI		 നടപംപ്റം	641166670
			O Eace)a[}^a O Eace)a[]∧a
E-WiGe			Uzaanga[}∩a ìì⊏¤ïî
EWIG G		വില്ല നില്ലി	ലില്ല നടപാപ്≀∧പ്
€wî Q Ó			
€FWÎCIÔ	ÌÌFËI	 	 ດ∏ຄອງຈໍ[\∧ຈໍ
€FWÎCIÖ		 	 ດ∏ຄອງຈໍ[\∧ຈໍ
€FWÎ CÍ CI			ii FÉH
€FWÎGÍÓ	ÌÌHÈI€		ÌÌFËÌ
€FWÎGIÔ	ÌÌÏÀF	llà∙d`&∧å	llà∙d`&∧å
€FWÎGİÖ	ÌÌHĖF		
€FWÎ Ĝ O	iiΩ#ï		ÌÌFËF
€FWÎGÎÓ	ÌÌHĚ€	) ï ï Ħ Ì	ÌÌFÈ
€FWÎGÎÔ	ÌÌHÉÌ	<u>іїї</u> н	
€FWÎGÎÖ	ÌÌHĒF	ÌÏÏÈC	
€EMÎ GÏ O	ÌÌGĒÏ		ÌÌΩË∉
€FWÎGÏÓ	ÌÌHÉÏ		
€EMÎGIÔ	ÌÌHÉÎ		ÌÌFÌÊGI
 €EMÎ Ĝ Ö	i i heři	<u>ії ён</u>	ÌÌFÌĤ€
€FMÎ A A			
€FWÎĠÓ	ii∉Ĥ		OFaaa}å[}^å
€FŴÎ ĈĨ Ô		<u> </u>	<u> </u>
€FŴÎ Ġ Ö			OFaaa)å[}^å
IÌG€ÌÍÁ©S€FT⊻Γ			OFaaa)å[}^å
II G€I LÁSS€GT V L	ÌÌÏĤF		OFaaa)å[}^å
IIG€IHÁCS€ITYΓ			
€HŴGF	ÌÍÌĖ́H	lî FÈÏ	ÌÎFÊF

#### HUV`Y`- ''(

#### HfYUha Ybh'GmghYa '7 cbW/bhfUhjcbg'fCf[Ub]Wg/L :]gWU'MYUF'&\$% G]hY'?žCI & 5fXYb'<]`gžA]bbYgchU

			22/18 JW `cfcYh UbY	%⊉A8]W`cfcYh YbY	%2&&8]W`cfcYh UbY	Wgg!%8248]WV`cfcYh\YbY	hf Ubg!%&ei8 JW`cfcYh YbY	Hf]W`cfcYh YbY	Jbm`W`cfJXY
	9ZZiYbhi@ja∶	]h <sup>f⊮</sup> ⊾	!!	+'\$	• "	+\$	% <b>\$</b> \$	% <b>\$</b>	\$'%
@cWUhjcb	8 UhY		±[ #@	±[ #@	±[ #@	±[ #@	±[ #@	±[ #@	±[ #@
Ò~- ˘^} c	FGÐFFBG€FÌÁ		ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	IÈ€Á	ŁÁFÈ€Á	€ËÎÁRÚÁ	ŁÁFÈ€Á
Ò~- ˘^}c	Fœ∎FreefìÁ	Ö	ŁÁFÈ€Á	ŁÆRÈ€Á	ŁÁFÈ€Á	IÈEÁ	ŁÁFÈ€Á	€ÈÈ FÁRÚÁ	ŁÆRÈ€Á
Ò ˘^}c	HÐÍÐЀFJÁ		ŁÁFÈ€Á	ŁÆRÈ€Á	ŁÁFÈ€Á	ÎĖĖÁ	€ÈĤÁRÚÁ	FÈFÁ	ŁÁFÈ€Á
Ò~- ˘^} c	HÐÍÐЀFJÁ	Ö	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ÎËÁ	€ÈHÌÁRÚÁ	FÈGÁ	ŁÁFÈ€Á
Ò~- ˘^} c	ÎÐ9FE9€FJÁ		ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	JÈ€Á	€ÈËÏÁRŪÁ	FÈÁ	ŁÁFÈ€Á
Ò~- ˘^}c	ÎEO9FEO9€FJÁ	Ö	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ÌĚÁ	€ÈÈFÁRŪÁ	FĚÁ	ŁÁFÈ€Á
Ò~- ˘^} c	JÐÍЀ€FJ		€ÌEI€ÁV	€ÌEI€ÁV	€È€ÁV	ΙÊ	€ÌÉI€ÁV	€ËHÁR	€È€ÁV
Ò~- ˘^}c	JÐÍЀ€FJ	Ö	€ÌEÉÁV	€ÌEÉÁV	€ÌH€ÁW	ΙÈ	€ÌÈI€ÁV	€ĒÌÌÁR	€ÌH€ÁV
Q, ⊣ັ^} c	FGÐFFED€EFÌÁ		ŁÁFÈ€Á	€ÈE€ÁRÚÁ	ŁÁFÈ€Á	FÍ €Á	FJÁ	ÍGÁ	FÈHÁ
Q, ⊣ັ^} c	HÐÍÐЀFJÁ		ŁÁFÈ€Á	€ÈLGÁRÚ	ŁÁFÈ€Á	FÍ €Á	GGÁ	ΙÌÁ	FÈFÁ
Q, ↓ ^ } c	ÎEOEFEO€EFJÁ		ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	JFÁ	FGÁ	HFÁ	€ÈË GÁRÚÁ
Q, - `^} c	JÐÈЀFJ		€È€ÁV	€ÈÈHÁR	€È€ÁV	F΀	FI	ÍF	FÈ

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 $\begin{array}{c} \langle F^{T}(A\hat{W})\hat{v} \rangle \diamond \bullet caa) \langle a\tilde{q}, A\hat{U}, A\hat{v} \rangle & \langle A\hat{O}[8, 4, 4] \rangle \langle A\hat{O}[8, 4] \rangle & \langle$ 

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#### HUV`Y`- ")

#### HfYUha YbhiGmghYa '7 cbWYbhfUhjcbgʻf#bcf[Ub]Wg/L :]gWU`MYUF`&\$% G]hY`?žCI & 5 fXYb`<]``gžA]bbYgchU

			7 cddYf	7 mbjXY	<b>B</b> UX	A Yf W fm	ଗ] ୪	WdĮN	HcIV 'D\ cgd\ cfi g
	9ZZiYbh@	<b>]</b> a ]h <sup>f™</sup>	&%	%+	<b>%\$</b> *	\$"&\$	' "(	%(	%\$
@cWUhjcb	8 UHY		±[ #@	<b>±[</b> #@	±[ #@	±[ #@	<b>±[</b> #@	±[ #@	a [ <i>#</i> @
Ò~+˘^}c	Fœ⊒FF®e∈FÌÁ		GGÁÐÁGHÁ	ŁÂ瀀ÍÁ	ÎÈÁ	ŁÆÈĒ€Á	ŁÁFÈ€Á	GHÁ	€Ì€Á
Ò~- ˘^}c	FÐÌÐЀFJÁ		FÈLÁ	Ë	Ë	Ë	Ë	Ë	Ë
Ò~- ˘^} c	HÐÍÐЀFJÁ		IĒÁ	ŁÁ <del>F</del> €Á	ŁÁFÈ€Á	ŁÆÈE€Á	ŁÁFÈ€Á	ÎÈEÁ	€ÈĜÍÁRÚÁ
Ò~- ˘^} c	ÎEOEFED€EFJÁ		GÌFÁ	ŁÁ <del>F</del> €Á	ŁÁFÈ€Á	ŁÆÈE€Á	ŁÁFÈ€Á	ÎÈÁ	ŁÁ€ĽĚ€Á
Ò~+˘^} c	JÐÍЀ€FJ		GĽ	HÈ€W	€ÌH€ÁW	€ÈÈFÁW	€ÌH€ÁW	GË	€ÈH

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<sup>(FT</sup> Ù à • cæ) cấç^ Ü^˘ă^{ ^} cÔ[ & { ^} cÔ[ } & } dæađi } Šã[ ãdÊT æ¢ā[ ` { ÁÖæađi ` Ò→-|`^} cÔ[ } & } dæađi } È WË⁄W@ æ) æ¢ c^, æ• Á[ cå^c^&c^à æà[ ç^ c@ T ÖŠÈ RÚ/ÆÜ/•• `|cā\* Á čædãað å æ• ^• cã] æ¢ å • ā] & ^ c@ å^c^&cãi } ã\* Ás^|[ , c@ |æà[ ¦æaťi ¦^ č ě) cãææđi } |ã] ãdÈ HUV`Y`- '\*

#### GiaaUfmCZAcbh\`mJC7'FYacjU :]gWU'MYUF'&\$% G]hY'?žCI& 5fXYb'<]`gžA]bbYgchU

	HchƯʿAcbh\`mi :`ck	HchƯ`JC7` ⊫oZiYbh	HchƯJC7 9ZZiYbh	HchƯ JC7g HfYUhYX	HchƯ`JC7g` FYaU]b]b[	HchƯJC7 ʿAUggʿ FYacjYX
Acbh	f[ Ư`cbgŁ	f <b>£</b> [#@_	f <b>±</b> [ #@_	flVgŁ	flVgŁ	flVgŁ
Ô~{` æaãa,^Áæe Á,-ÂÙ^]c^{à^!Á+1EÉGGEFÌ						ĤJÈ€
U&ą[à^¦ <sup>ŒD</sup>	lÍHÊĒÏ€	GGH	I È I	€ÈI	€È€G	€ÈG
Þ[ç^{ à^¦ <sup>ŒD</sup>	IÎHĒÊ΀	GGH	I È I	€ÈÎ	€È€G	€ÌI
Ö^&^{ à^¦	IHFÊFH€	GGH	I È I	€È€	€È€G	€ËÌ
Ræ), čæh <sup>^(∉D</sup>	HJJÊF€	GGG	ÌÈGÌ	€ËI	€È€H	€ËF
Ø^àlằæ <sup>^,ŒD</sup>	GÎÎĒÎÌ€	GGG	ÌÈGÌ	€ÈIJ	€È€G	€ÈÏ
T æ&@	HFÍÊ€HÏ	GGG	ÌÈGÌ	€ĚÌ	€È€G	€ĚÎ
ŒĮ¦ā <sup>ĢED</sup>	HÏ JÊÏ H	FHÍ	F€ËI	€ÈH	€È€H	€ÌHJ
Tæ <sup>̂</sup> <sup>∉D</sup>	IÌÏÊÎI	FHÍ	F€ËI	€ĚÍ	€ÈE	€Ě€
R }^	IÌ JÊFÎ Î	FHÍ	F€ËI	€ĽÍÍ	€ÈE	€ĽÍF
R″   <sup>^</sup> <sup>(</sup> <sup>₽</sup> D	IIÍ ÊG€	GÂ	ÍÈF	€ÈI	€È€G	€ÈG
Œ * ઁ • c <sup>ŒD</sup>	IÎÍ ÊÏG	GÂ	ÍÈF	€ÈÌ	€È€G	€ÌÎ
Ù^] ♂{ à^¦	I Î FÊÏ G	GÂ	ÍÈF	€ÈÏ	€È€G	€ÌÍ
V[œ4ÄÄØŸÁG€FJ	ÍÊE΀ÊEÍI					ÌÈH
Ô`{` æãç^Á/[ÁÖæe^						ΗJΪÈĒ

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<sup>(FD</sup>Q, -|`^} of & ÅÔ--|`^} of XUÔ/&[}&^} d æ af } • Á{[{ Ás@ Á ` æ e^¦|^ ÁXUÔ Á æ {] |^• Á&[ ||^ & e^ å Af } ÁF GBF FEDEFÌ ÉAHD EDEFJÉA EDEEDEFJ & a Å AD EDEFJÈ

#### %a(!8]clUbY; fcibXkUhYf'GUad`]b[`FYgi`hg :]gWU`MYUf'&\$% G]hY??žCl& 5fXYb'<]`gžA]bbYgchU

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GW	YYb]b[ '7f]hYf]Ufk	F@L%\$
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#### HUV`Y`%\$!% GiaaUfmicZ6ij`X]b[`%\$&`G\U`ck`; fcibXkUhYf`Acb]hcf]b[`FYei]fYaYbhg :M&\$%`5bbiU`FYdcfh Hk]b`7]h]Yg`5fam5aaib]h]cbg`D`Ubh 5fXYb`<j``gžA]bbYgchU



	FYa YXm7 ca dcbYbh	Acb]hcf]b[ ˈFYei ]fYa Ybhg	=ad`YaYbh]b[ <sup>∵</sup> DUfhm	8 cW∛aYbhgʻ7 cbhUjb]b[ʻ h\Y`A cb]hcf]b[ʻD`Ub
ÀFK	T[}ãt[¦^åÁ>æcĭ¦æ‡Á0Ecc^}ĭæeāį} Çæàājcã&Ása^*¦æåæeāj}D	æÈ Učdậ,^åÅa∿∥[,		
ÀGK	Õ¦[`}å,æe^¦ÁT[}ãa[¦ã),*	æÈ U`dậ,^åÁa^∥[,		
ÀНК	Šæ); åÁ∿•^ÁÔ[}d[ •Á[ÁÜ^•da&cá Y^  ÁQ>•cæ);aæa‡]}Áæ); åÁ[ÁÚ¦[c^&cá c@:ÁÜ^{ ^â^ÁQ; ⊣æ•d *&cč¦^	æĖÞ[}^È		
UÜK	. Uç^¦æ∦ÁÜ^{ ^å^ÁÇEncæni}{ ^}o4(`~ `Ô ^æ)`]ÁÕ[憕D	Õ¦[`}å, æe^\¦Á`æ¢aãCÁåæææ4o@[`*@[`&@`óko@·Á Ó`ā¦åā]*ÁF€CAJ]`{^ÁtjÁ^çæ†`æe^Áæeœæ æÈæ}åÁt[Áç^¦ã`Ás@æe/*¦[`}å,æe^\Á^æ&@3,*ÁÜ&&^A Ô¦^^\Áå[^•Aj.[o4\¢&^^åAcæer^Ai`¦-æ&^Ajæe^\Á •cæ)åæåå•È	\ <b>C</b> €{ ^	Ó`a¦áāj*Ár€GÁT[}ãa[¦āj*Á Ú æ)Á§IÁo@AO5}}`æ4Á Ú^¦-{¦{æ)&^AÜ^][¦c

#### HUV`Y`%\$!& 6 i ]`X]b[ `%\$&; fci bXk UhYf`E i U`]hm8 UHU : M`&\$% `5 bbi U`F Ydcfh Hk ]b`7 ]h]Yg`5 fa m5 a a i b]h]cbg`D`Ubh 5 fXYb`<]``gžA ]bbYgcHJ



a joint venture

GUad`Y`@cWUl]cb	8 UHY	Hf]W(`cfcYl\YbY` fl[#@L	%ã(`8]clUbY` fl[#@L	₩]g!%#&! 8]W(`cfcYh\YbY` fl[#@L	%2%48]W(`cfcY1\YbY` fl[#@L	J]bm`7\`cf]XY fl [ #@_	J]bm`7\`cf]XY <sup>W</sup> fl [#@L
Óٽą̃åą̃*Á∓€GÁÔ ^æ), č] ÁŠ^	ç^ Æ	Í	Ē	Ï€	Î	€ÈÌ	€ÈÈÌ
T ÖP ÁP ÜŠ <sup>à</sup>		Ë	F	Ē	Ë	Ē	Ë
€FŠÍ Ì F	Î⊕FFFFJ	ÍÈ	ŁÆÈËÏÁW	HÈH	ŁÆÈ€ÁV	ŁÁFÈ€ÁW	ÞŒ
€FŠÍ Ì G	ÎÐÊ₽FJ	ŁÆÈ€ÁV	€È€HIÁR	ÌĒ	ŁÆĖ€ÁV	ŁÆĒ€ÁW	€È€Î
€FŠÍÌH	Î₽₽F₽₽J	ŁÆRÈ€ÁW	ŁÆÈËÏÁW	ŁÆÈ€Á₩	ŁÆĖ€ÁV	ŁÆĖ€Á₩	ÞŒ
€FŠÍÌHÁÖWÚ	Î₽₽F₽₽J	ŁÆÈ€ÁV	ŁÆĖĖËÄW	ŁÆÈ€ÁV	ŁÆĖ€ÁV	ŁÆĒ€ÁW	ÞŒ
€FŠÍÌI	Î₽₽F₽₽J	FF	ŁÁ€È€ÏÁV	ÎÈ	ŁÆRÈ€ÁW	ŁÆRĚ€ÁW	ÞŒ
€FWEIÌ	Î₽₽F₽₽J	ŁÆÈ€ÁV	ŁÆÈËÏÁW	ŁÆÈ€ÁV	ŁÆRÈ€ÁW	ŁÆRÈ€ÁW	€È€Í
€FWÍÏJ	Î₽₽F₽₽J	€ÈLÍÁR	ŁÁ€È€ÏÁV	ŁÆĒ€ÁV	ŁÆRÈ€ÁW	ŁÆRĚ€ÁW	ÞŒ
€FWÍÌ€	Î₽₽F₽₽J	€ËĽFÁR	ŁÁ€È€ÏÁV	FÈ	ŁÆRÈ€ÁW	ŁÆRĚ€ÁW	ÞŒ
€FWÍÌF	Î₽₽F₽₽J	FÌ	ŁÁ€È€ÏÁW	FΪ	ŁÆRÈ€ÁW	ŁÆRĚ€ÁW	ÞŒ
€FWÍÌG	ÎÐÊ₽FJ	ŁÆRÈ€ÁW	ŁÁ€È€ÏÁV	GÈH	ŁÆRÈ€ÁW	ŁÆRĚ€ÁW	ŁÁ€È€Í€ÁW
€FWÍÌH	Î₽₽F₽₽J	ŁÆÈ€ÁV	ŁÆĖĖĖĖĖ́AV	ŁÆÈ€ÁV	ŁÆĖ€ÁV	ŁÆRĚ€Á₩	ÞŒ
€FWÍÌI	Î₽₽F₽₽J	€ÈHJÁR	ŁÁ€ÈEÏÁV	GÈ	ŁÆRĚ€ÁV	ŁÆÈ€ÁV	ÞŒ

: cchbch¥g.

æĚV@Á&|^æ)č]Á^ç^|Á{¦ÁŐčāåā;\*Á∓€GÁŐ¦[č}å,æc^¦ÁāÁ¦[{Á,æč^ÁGËFHÁ;ÁUWGÁÜ^&{¦åÁ;ÁÖ^&ãrát}ÁQĘ^}å{A @måā;\*Á§å&8æe\*•Á×¢&^^åæ)&^Á;Á@Á&|^æ)č]Á^ç^|È àÈÞ[ÁŐčāåā;\*Á∓€GÁ&|^æ)č]Á^ç^|Á@eeÁs^^}Á\*•œæà]ã@åÁ{¦ÁrÊÊãat;¢æ)^ÈÁQ[¦Á^^?}&^É&©ÁTā}}^•[œæÄÖ^]æid{^}of,AP^æbcØÁQTÖPDÁP^æbcØÁUã\ÁŠa[ãAQPÜŠDÁ{¦ÁrÊË åãţ¢æ)^ÁarÁµ\*EŠEŘŐ¦æÉÁ @æåð]\*Á§å&8æe\*•Á×¢&^^åæ)&^Á;Ác@ÁPÜŠÈ

8 A Świet Ś

#### 5 Wichma gʻUbX`5 VVfYj]Uhjcbg.

HEEEMAÁ, [Á∧|^çæa) oKs[∧æa) č] Á∧ç∧|Á, ¦ÁP ÜŠÁL; ¦Ác@ar Á&[{][č]}å
 ŁÁYĚY UÁMÁae) æa∱ c^Á, æa Á, [oňsa∧c^&ca áAsae] ç∧Ás@ará&a áAT ∧cq@a á/Ö∧c^&ca], AŠã[ ão/QT ÖŠD
 Ö`] ÁMÁs`] |∂Bease∧
 RÁMÁ∧][¦cªakáçæa) ∧Ásr Ása∧ç, ∧^} Ás@ ÁT ÖŠÁse) a áko@ ÁÜ∧][¦c∄]\*ÁŠã[ ãc
 ÞOEEMÁræ[]|^Á,[ofse) æa∱: ^aÁL[¦Ás@ar Á&[{][č]}å
 UWÁAÁU] ^¦æa|^ÁN} ãoÁ
 µ\*EŠÁMÁL[æ3L[\*¦æ4]•Á,^!Áãc^!

#### HUV`Y`%&'%

#### ; fcibXkUhYf'7`YUbid`@/jYg H; FGžCI& 5fXYb`<]``gžA]bbYgcHJ

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dæ)•ËFÊEËÖ&&@[¦[^c@}}^	ŁFÈ€	Ï€
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FÊFÊFË/¦&&@{[; [^c@æ)}^	ŁFÈ€	G€€
FÊBËÖ&&@[¦[^c@e)^	ŁFÈ€	IÈ€
V¦&&@{[  [ ^c@^} } ^	ŁÍÈ€	ÍÈ€
FÊFËÖ&&@[¦[^c@ee)^	ŁFÈ€	Ï€
V^dæ&@[¦[^c@}}^	ŁFÈ€	ÍÈE

#### HUV`Y`%&"&

# 9lhfUWFjcbʻKY``KUhYfʻDiadYX :]gWUʻMYUfʻ&\$% H;FGžCl& 5fXYbʻ<]`gžA]bbYgchU

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ÁÇ]{[	GG	GGF	FÎ G	H€Ï	GHF	FÌΪ	Я́ F	€	FF€	FJ	€	FFH	FÊIG
Þ[ç^{ à^¦ÁG€FÌ	JÊHJÊ€€	ÌÊÌFÊ€€	ÎÊJ€HÊÊ€€	FHÊÍHFÉÍ€€	F€Ê€EËËÊ	ÌÊ€JJÊ⊖€€	JÊÏJÊ€€	€	IḖÍIĒ€€	Ï Ï FÉ €€	€	ÍÊLJFÊJ€€	ÏÏÊ΀ʀ€
ÁÇ]{[	) GFÌ	FJÍ	F΀	HFÌ	GHF	FÌΪ	GÁ	€	FF€	FÌ	€	FGÏ	FĒJ€
Ö^&^{ à^¦ÁG€FÌ	F€ÊĴHÊ€€	Ì <del>ÊH Ê€€€</del>	ÎÊÏFÊ€€	FIÊGJHÊ€€€	JÊIÎÊ <del>K€</del> €	ΪÊŧ€€	FFÊÊ FÌ ÉÉ €€	€	I ÊFI Ê€€	Ì Ĝ Ê€€	€	I Ê G€Ê €€	ï JÊ=î Î É €€
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Ræ),≚æl^ÁG€FJ	F€ĒÎHÊH€€	JḖHĒ€€	ÎĒĒFÎĒĒ€€	FIÊHÎIÊ∓€€	F€ÊFHÊ€€€	ÍỀʀ€€	FFÊLFÏÊ <del>€€€</del>	€	ÍÊÈÌGÊH€€	Ì I FÊ €€	€	HÊ€€Ê€€€	ÏÌÊĴÌHÊÊ€€
ÁÇ]{[	) GHÎ	ŒÎ	FIJ	HFJ	GF	FGG	G G	€	FFÍ	FJ	€	ÌI	FÊÍH
Ø^à¦ĭæ¦^ÁG€FJ	JÊĤHÊĒ€€	F€ÊÊJHÊJ€€	ÍĒÎÏĒ€€	FQĒÎFÍĒÌ€€	ÌÊJHEÉÉ€€	IÊI€Ê€€	F€ÊGFÊ€€€€	€	IÊÍÏÉ€€	ÏÍIÊF€€	€	HÊFGÊ€€€	Ï€ḖÍÎĒ€€
ÁÇ]{[	GH	GÍÍ	FLI	HFÌ	GGH	FFÏ	Ć G	€	FFÎ	FJ	€	ÌН	FÊÎG
Tæl&@ÁG€FJ	F€ÊĜÌIÉÉ€€	F€ÊÊ€ÌÊF€€	ÎÊFHJÊ€€	FHÊĴÌÍĒÊ€€	JÊÌIÉ€€	ÏÊÎFIÊ€€€	FFÊÊGJÊŒ€		ÍÊÈÌÎÊ€€	Ì€GÉÉ€€	€	HÊÊJÍÊÊ€€	ÏÌÊJH€ÊG€€
ÁÇ]{[	G <del>I</del> €	GÂ	FHÌ	HFH	GFÎ	FΪ F	Ĝ€	€	FFÎ	FÌ	€	ΪÌ	FÊÎÏ
OĘI¦ã¦ÁG€EFÌ	JÊHGÊ€€	JÊJÌÏÊF€€	ĺÊÌÌÊ€€	FŒŰJFÉÉ€€	JÊÌFÊ€€	ÏÊGÊ€€	FFÊHÎIÊ€€	€	ÍÊEHGÊÊ€€	ÏÌÌÊ€€	€	HÊFÏÍÊG€€€	ïîÊîìÊ <del>F</del> €€
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ÁÇ]{[	) Gấ	GHF	FHF	H€Í	G€	FÌ I	Ğ F	€	FFÍ	FÌ	€	ÎJ	FÊÌÌ
R″}^ÁG€FÌ	JÊÏGÊ€€	JÊJÍÎÊ€€	ÎĤÌÌĤ€€	FHÊFÊĪÊ€€	F€ÉÍÎÊ€€	Ï ÉGGIÉÉ €€	F€ÊÏJÊE€€	€	IÊJÍÊH€€	ï̌ɀ€	€	GÊHÏÊE€€	ÏÏÊEHÎÉE€
ÁÇ]{[	EG CG	ପ୍ତୋ	FÍ F	H€Í	GН	FÎ Î	Я́ G	€	FFÍ	FÌ	€	ÎÏ	FÊÎJ
R″∣^ÁG€FÌ	JÉÍGÊF€€	ÌÊGÌÏÊF€€€	F€ÊÍIÊ€€	FHÉÍJÏÊ€€€	JÊÏJÊ€€	ÎÊÊ€ÈÊ€€€	FGÊ€€EIÊЀ€€	€	ÍÈEÌÎÉÉ€€	Ï JÍ Ē€€	€	GÊÎHGÊĨ€€	ÏÌÊÎJÏÊE€€
ÁÇ]{[	) GFÏ	FÌΪ	GĤ	H€Î	GFI	FIJ	Ğ€	€	FFÍ	FÌ	€	ÎI	FÊÏÎ
ŒĨŤ∙oÁG€EFÌ	Ì ÊFÎ JÊÍ €€	JÊEÏÏÊF€€	F€ÉÏÍÊ₽€€	FHÊE€	JÊÎJHÊÊ€€	ÏÊEÎHÊG€€	FFÉÉÍÏÊ€€€€	€	ÍÊÈÌFÊH€€	ÏÌJÊ€€	€	GĒÎÌÎÊŒ€€	ÏÌẾJÌÊ <del>F€€</del>
ÁÇ]{[	FÌ G	G€G	GHÍ	H€Í	GGF	FÍΪ	Ĝ€	€	FFH	FÌ	€	ÎG	FĒÍÎ
Ù^]c^{à^¦ÁG€FÌ	JḖFÌĒ€€	ÌÊ€FFÊG€€	F€ÊFÏIÊH€€	FGÉÍIJÉÉ€€	ÌẾJÎÊ€€	ÎÊ€JIÊF€€	FFÊEÏ€ÊĴ€€€	€	IÊÌFÊ€€	Ï FJÊ <del>€€€</del>	€	HÊHEHÊ€€	ÏIÊÊFJÊ€€
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HchU':M1&\$%	%⁄+ž &\$ž( \$\$	% <b>/&amp;ž&amp;' (ž</b> \$\$	, - <del>2</del> \$, ) 2 <b>)</b> \$\$	% 8 <b>ž</b> \$' ( ž \$\$	%%, ž&\$) ž \$\$	, ( ž+( ) ž⁄\$\$	%) <i>2</i> /\$+ <sub>2</sub> \$\$	\$	) - ž( ++ž\$\$\$	- ž) \$( ž- \$\$	\$	('ž-(+ž \$\$	-'% <b>ž</b> *8ž\$\$
U]^¦æaāį}æa¦ÁTā)ā[`{ AÇ;]{[	GG	FĨ€	FJİ	FJİ	Œ€	FH	GI	İ€	FF€	G€	H€	F€€ FI€€	FĒLĪ
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TUÙÁU]^¦æaāį}æaÅTājāį č{ÁÇ]{D

#### HUV`Y`%&"

#### HfYUha Ybh'7 Ybh'7f KUh'yf A Yh'yf HcHU'g :]gWU MYUf 8\$% H; FGžCI& 5fXYb <]``gžA]bbYgcHU

	Jc`i a Y`cZK UhYf`Di a dYX`f[ U`cbgŁ											
	91 hfUWMjcb			HcHJ.			HchƯ			HcHJ		
	ΚΥ`g	A Yh¥f '%	A YhYf '&	AYh¥fg`%∕`&	A Yh¥f "	A Yh¥f (	AYh¥fg" '∕ '(	A Yh¥f')	A YhYf '*	A YhYfg`) '⁄ '*		
U&q[à^¦ÁG€FÌ	ÌGÊHIIÊG€€€	€	€	€	€	HÊÊ€GÊ€€€€	HÊÊ€GÊ€€€€	€	€	€		
Þ[ç^{à^¦ÁG€EFÌ	ÏÏÊ΀ʀ€	€	€	€	Ì FÊ€€€	FÊHIÊ€€€€	FÊLGÍÊ€€€€	€	€	€		
Ö^&^{ à^¦ÁG€FÌ	Ï JÊÊÎÎÊÉ€€	€	€	€	IÏÊ€€€	€	IÏÊ€€€	€	€	€		
Ræ),≚æl^ÁG€FJ	ÏÌÊJÌHÊE€€€	€	€	€	IÌÊ€€€	€	IÌÊ€€€	€	€	€		
Ø^à¦ĭæ¦îÆFJ	Ï€ḖÍÌĒُ€€	€	€	€	GJÊ€€€	€	GJÊ€€€	€	€	€		
Tæl&@ÁG€EFJ	ÏÌÊJH€ÊG€€	€	€	€	FHÊ€€€	€	FHÊ€€€	€	€	€		
OĘI¦ã¦ÁG€EFJ	ÏÎÊÎÌÊ <del>E</del> €€	€	€	€	€	€	€	€	€	€		
TæÎÁG€FJ	ÏÌÊ€€Ê€€	€	€	€	€	€	€	€	€	€		
R″}^ÁG€FJ	ÏÏÊEHÎÊÉ€€	€	€	€	€	€	€	€	€	€		
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Œ* <b>`∙</b> ¢Æ€€FJ	ÏÌḖJÌḖ€€€	€	€	€	G€Ê€€€	€	G€Ê€€€	€	€	€		
Ù^] c^{ à^¦ÁG€FJ	Ï I Ē FJĒ €€	€	€	€	I Ê€€€	€	IÊ€€€	€	€	€		
HchU':MT&\$%	-'%ž*8ž\$\$	\$	\$	\$	8( * ž\$\$\$	) <del>Ž⁄(</del> * ž\$\$\$	) Ž - &ž\$\$	\$	\$	\$		

#### HUV`Y`%&"

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Jc`i a Y'cZK UhYf'Di a dYX'f[ U`cbgŁ										
	91 hfUWMjcb			HchƯ.			HchƯ			HchƯ
	КŶ`g	A Yh¥f '%	A Yh¥f '&	AYh¥fg`%∕`&	A Yh¥f "	A Yh¥f (	AYh¥fg" '∕ '(	A Yh¥f')	A Yh¥f '*	A YhYfg`) '⁄ '*
ØŸÆJÌJ	FÊ€HHÊHÍHĒĒÏÎ	Í€FÉÍGÍÊ€€€€	Í΀ÉÊHÎÊĒ€€€	FÊEÎGÊÊÎGÊÊ€€€	HÌHĒÍHÎÊĒ€€€	ÍÌÏÉÍJÎÊ€€€	JÏ FÊHGÊ€€€	IJHĒÈÌFÊ€€€€	ÍÌGÊĴÍÍÊ€€€	FÊEÏÎÊÊHÎÊE€€€
ØŸÆJJ€	FÊE€ÈÊÊFÍÊÉÍ€	IJHÊĴFÍÊĒ€€€	Í GÎ ÊE FÏ Ê€€€€	FÊ€G€ÊÊHGÊ€€€	HÏ FÊ÷UFÊ€€€€	ÍÌÌÉEIGÊ€€€€	JÎ €Ê <del>EHÊE€€</del>	IÌÏÊJIÎÊE€€€	ÍIHĒÍGÎÊĒ∈€€	FÊEHFÊÊÏGÊ€€€
ØŸÆIJJF	FÊHÌGÊÊHGÏÊÉJ€	ÎÎÎÊÊÊÎÊÊ€€€€	Ï€ÌÊFHÊ€€€	FÊHÏIÊÊÏJÊ€€€€	ÍGHÉĨ€GÊ€€€€	ÏÌJÊIÏÊ€€€	FÊHFHÊÎIJÊ€€€	΀FÊH€ÏÊ€€€€	Î I JÊÎ ŒÊ€€€	FÊGÍ€ÊÐGÌÊĒ€€€
ØŸÆIJJG	FÊE€FÊHÎÊ€€	ÎÌÊGÌJÊE€€€	ïgê£HG`Ê€€€€	FÊE€ÏÊ£GÏÊ€€€€	ÍÍÏÊÊÎJÊ€€€€	ΪΪŒĒ€€€	FÊHGJÊËÏÌÊ€€€€	ÏÎÏÊÉ€ÏÊ <del>€€€€</del>	ÎÏÏḖHÍĒ€€€€	FÊIÍÊIGÊ€€€
ØŸÆIJIJĦ	FÊHÌÌÊG€ÎÊFÏG	ÎÎÎÊFIÊ <del>€€€</del>	ï gí ÊH fÊ€€€	FÊHJGÊFÍÍÊÊ€€€	Í€IÊ€GÏÊ€€€€	ÎÍFÊFIJÊ€€€	FÊFÍÍÊÊFÏÎÊ€€€€	ïgjêeïìê∈∈€	ÏÎGĒÎJFÊ€€€	FÊLJFÊÎJÊ€€€
ØŸÆIJIJ	FÊGIÍ ĒÊÎHÊĞÏÍ	Î΀ÊE€€Ê€€€€	ÎÍJÊJÍHÊ€€€	FÊHGÆÊÊÍHÊ€€€€	IÍÏÊGF€Ê€€€€	ÏFÍĒÊÎÌĒ€€€	FÊFÏGÊÊÏÌÊ€€€€	ÎÍHÊĴFHÊ€€€€	ÍÍ€ÊHFÊ€€€	FÊG€IÊEIIÊ€€€€
ØŸÆIJJÍ	FÊHÎ JÊHÎ FÊĒ €€	Ï €Î ÊFFI Ê€€€	ÎÌHÊĴÌGÊ€€€	FÊHJ€Ê€JÎÊ€€€€	Í€€ÊĞÏÍÊÈ€€€	ÏHJĒĪIIĒ€€€	FÊGI €Ê€FJÊ€€€	I JÍ ÉÉ FÎ Ê <del>€€€</del>	Ğİʀʀ€€	ΪΪ€ÊÊGHÊ€€€€
ØŸÆIJĴ	FÊHIFÊÊÎHÊGG€	ÏHIÊIHÊ€€€€	ÎGUÊHCÏÊ€€€€	FÊHÎHÊËπʀ€€	Í€HÉÉFÌÈÉ€€€	ΪÍΙÊHUJÊ€€€	FÊGÍÏÊJFÏÊ€€€€	I Ê <del>€€€</del>	΀€ÊÊEHÍÊ€€€€	΀€ÊÊHJÊ€€€
ØŸÆIJÏ	FÊGFHÊ€HÍÊFF€	ÎÌÌÊHFGÊ€€€€	ÍÌÌÊ€Ē€€	FÊGÍÏÊFFÎÊÊ€€	ÍHÌĒÍGÍÊ€€€€	ÍÌÎÉÉFÍÊ€€€€	FÊFGÍ ÊFI €Ê€€€€	FHÊ€€€	ÍÏÌÊJ€€ÊÊ€€€	ÍÏÌÊJFHÊE€€€
ØŸÆIJĴ	FÊFJΠʀ€Ë ÊJ€€€	ÎGEÊÌIÊ€€€€	ÍI€ÊHÍHÊ€€€	FÊGG€Ê€ € Ê€€€	Í FFÊ€Î Í Ê€€€€	΀HÊÏFÊ€€€	FÊFFI ÊJHΠʀ€€€	ÍÌÊ€€€	FÏÌÊ€ÏÎÊ€€€€	FÏÌÊFHÊ€€€
ØŸÆIJIJ	FÊFÍÌÊBGIÊËÏ€	ÎGHÊE€€Ê€€€€	IJÎĒËÏHÊG€€€	FÊFÏÏÊĐ€ÊÊĐ€€€	HJÌÊG€Ê€€€	ÏFÌÊHÌIÊ€€€€	FÊFFÏ Ê€€E Ê€€€€	GΠʀ€€€	FÏ Ê€€€	IHÊ€€€
ØŸÁG€€€€	FÊFIÌÊIIÌÊHÍ€	ÎHÍĒÎGIÊE€€€	IÌJĒÎĴJÊ€€€	FÊFÌHÊGÍÌÊ€€€€	HÌ JĒ€JÊ€€€	ÎÎHÊÊ€ÏÊĒ€€€	FÊ€ÍHÊÉFÎÊ€€€€	€	€	€
ØŸÁG€€F	FÊFFHÊFÎHÊH΀	Î FI ÊH FÊ€€€	IIHÊÊÎÏÊ€€€	FÊFFHÊFÎIÊ€€€€	hfì Éi fï Ê€€€	Ï FÌ ĒÊÎ FÊ€€€€	FÊ€HÏÊETÏÌÊ€€€€	€	€	€
ØŸÁG€€€G	JFÏ ÊHFÌ ÊË ÏJ	IJFÊÊÌGÊÊ€€	IHIÊJÍJĒÉ€€	JG Ê≣ GÉÍ €€	GGÍÊÊ΀ÊÊ€€€	ÎÍ€ÊÊHJÊE€€€	ÌÏÎÊGUJÊ€€€	€	€	€
ØŸÁG€€EH	J€I ÊGJÍ ÊÉ Í €	ÍIÍÊGÌFÊ€€€€	HIÍÊÐJHÊ€€€	ÌJFÊGÏIÊ€€€€	FGÍ ÊĴÎ Í Ê€€€	ÏÍ€ÉÉFÌÊ€€€€	ÌÏÎÊÈÌHÊE€€€	€	€	€
ØŸÁG€€	J€ÌĒĒFÌĒĒ΀	Í FÌ ÊHJFÐÊ€€	HÏÎÊÈÌJÊÊ΀	ÌJÍÊGÌFÉÊ΀	GFÎ ÊFÏ Ï Ê€€€€	ÎÌ€ĒÎHHÊĒ€€€	ÌJÎÊEF€Ê€€€€	€	€	€
ØŸÁG€€Í	Ì JÍ ÊHHJÊÍ F€	ÍG€ÊÉËÏHÊÊ€€€	HÎHÊGÏÍÊ€€€€	ÌÌHÊHIÌÊ€€€€	GGIÊIGHÊ€€€€	ÎÍÌÈÉ€É	ÌÌHÊGGÌÊE€€€	€	€	€
ØŸÁG€€Ê	JGJĒĒFÍĒĒJ€	ÍHIÊH€ÍÊ€€€€	HÏÏÊÊJJÊ€€€	JFFÊÉ€IÊÊ€€€	GÎÎÊGUJÊ €€€€	ÎÎJÊJ€€€Ê€€€€	ÌHĴ ŒÊĴĴŒ€€€	€	€	€
ØŸÁG€€Ï	JIÍÊHFÏÊH€€	IIÏÊJ€FÊ <del>€</del> €€	IÌÏĒE€FÊ€€€€	JHÍ ÉÍ€GÊÉ€€€	Ġ FʀΠFÊ€€€€	ÌHHÊÊÎFÊ€€€	FÊFFI Ê9339Ê€€€	€	€	€
ØŸÁG€€È	JIHÊHFÌÊÊÎF	IGIÊGÌJĒĒFÍ	ÍFGĒĒHIĒ€JÍ	JHÎÊĴGHÊÊ€J	GFÏÊFHÊH€	ÏÏÌÊĒFÏĒÊG€	JJÍĒÍÍGʀ̀	€	€	€
ØŸÁG€€J	JGÍÊÐHOÐĒÍIÍ	HÍÏĒÊJÌÊĒ€€€	Í͌ɀ€€	JF€Ê€€HÊ€€€€	fï hÊ€€I Ê€€€	ÏJÍÊ€ÍÏÊ€€€€	JÎÌÊÊÊFÊ <del>€€€</del>	€	€	€
ØŸÁG€F€	JHHĒĖÌJĒ⊖€Í	HÎÌÊG΀ÊÊ€€€	ÍÍÌÊÊ΀ʀ€€	JG É Œ€€€€	ÎFÊJÍÏÊ€€€€	Ì JI ÊFÍ GÊ€€€	JÍÎÊF€JÊ€€€	€	€	€
ØŸÁG€FF	JÍGÊHÏJÊE€€€	FÌ HÊÊ΀ÊÊ€€€	ĜÌḖIÏÊ€€€€	IÍGÊЀÏÊĒ€€€	FÍÊËÏJÊ€€€€	ÌJ€Ềʀ€€	J€ÎÊHGJÊ€€€€	€	€	€
ØŸÁG€FG	JÎ I ÊJΠʀ€	€	€	€	Î JÍ Ê€€€	ÌIÌÊÊÎÍÊ€€€€	ÌIJÊÊ΀ÊÊ€€€	€	€	€
ØŸÁG€EFH	JGÉÍ€Ē€€	€	€	€	ÍÊE€€€€	ÌÌHÉËÏGÊ€€€€	ÌJFÊHHÌÊ€€€€	€	€	€
ØŸÁGEFI	JHÏÊHIÊÍI	€	€	€	HÊJÍÎÊ€€€€	ÌJÍÊËÏÎÊ€€€€	ÌJJÊEHGÊE€€	€	€	€
ØŸÁG€FÍ	JG€ÊÊJÏÊÊ€€	€	€	€	ÌÊFGGÊ€€€	ïgê <del>£</del> GíÊ€€€€	ÏHGÊÊIÏÊ€€€€	€	€	€
ØŸÁG€FÎ	J€ÏÉËÏÏÈÊÎI	€	€	€	ÏÊFIÍÊ€€€	ÎJ€ÊJÍÌÊ€€€	ÎJÌÊE€FÊ€€€€	€	€	€
ØŸÁG€FÏ	JGJÊJGÊ Ê €€€	€	€	€	GÊHJÊ€€€	ÍGÍÊÈHIÈ€€€€	Í GÌ ÉÈÌ HÊ€€€€	€	€	€
ØŸÁG€EFÌ	JFÏÊÊHÏÊÊ€€	€	€	€	FI HÊ€€€	ÍÌFÊJIÎÊ€€€€	ÍÌGÊÈÈÌJÊÈ€€€	€	€	€
ØŸÁG€FJ	JHFÊĴÎGÊÊH€€	€	€	€	GÎÊ€€€	ÍËIÎÊ€€€	ÍËHUGÊ€€€	€	€	€

ÕPÖÁ∓FG€ÎÍIFÁÇED

#### HUV`Y`%&"(

## Diad\cigY`8ckb`H]aY :]gWU`MYUF`&\$% H; FGZCI & 5fXYb <]`gžA]bbYgcHJ

KY` BUaY	:M% 8 c k b <sup>°</sup> H]aY fBUmgŁ	:M%) 8 ck b`H]aY fBUmgŁ	:M?%∔ 8 ckb`H]aY fBUmgŁ	:M%* 8 ck b <sup>:</sup> H]aY fBUmgŁ	:M%) 8 ck b <sup>:</sup> H]a Y fBUmgŁ
ÓF	FFÉ	F€Ð	HÉH	ΙĖ	GË
ÓG	ф.	Œ	Œ	<b>Ģ</b> ЕГ	ĢF.
ÓН	ΗĐ	ΗË	HĒ	JË	ÌĖ
ÓI	€Ē	FHÉ	HĒ	ΪĖ	Fۃ
Óİ	€Ē	HGĒ€	ΙĖ	JĒ	İË
ÖÏ	ΙĖ	FΪĖ	İĒ	ĨĒ	GĒ
ÓÏ	φĩ	ĢΈ	ምር	ĢFΓ	Œ
Óİ	FΪĒ	İĒ	ÏĖ	İÐ	İĖ
ĊJ	Fۃ	FI Ē	FFÉ	ŒĒ	JĖ
ÓF€	ф.	<b>Ф</b> Е	ÇFΓ	ŢF[	ŢF.
ÓFF	φĩ	ŢFL	ŢFL	ĢFL	ÇFΓ
ÓFG	<b>₫</b> ₽	ÇFI.	ĢFI	ĢFΙ	ÇFI
ÓFH	GÈ	FÌÈ	ΙÈΗ	HÈ	ΙĚ
ÜÖF	Œ	ÏÉ	ΗÐ	F€Ë	GË
ÙÔG	ф.	GÉ	HË	ÌFÈH	ΙÈ
ÙÔH	Ф.	Œ	Œ	<b>Φ</b> Γ	Ç <b>₽</b> [
ÙÔI	<b>₫</b> ₽[	ĢΈĽ	Œ	<b>Œ</b> Ι	<b>Ç</b> ∓[
ÜÖİ	ΪË	ΙĖΉ	GEE	FFË	ΪĒ

Þ[ c⁄ł

<sup>(FE</sup> V@Á^¢dæ&cāj}Á^||Á,æ•Á,[c4\$9,Á,]^¦ææaj}Å\*i3,\*Á@Áã\*&æ4Á^æ4E <sup>(GE</sup> V@Á^¢dæ&cāj}Á,^||Á,æ•Á9,Á,]^¦ææaj}Å4;¦A,;¦A,;¦A,#o4Á,Aæ4Á^æ4Á^æ4É

#### HUV`Y`%&')

#### 8 ck bʻH]a Yʻ6 m'7 UhY[cfn :]gWUʻMYUf`&\$% H;FGžCI& 5 fXYb`<]`gžA]bbYgchU

7UhY[cfm	8 ck b <sup>°</sup> H]aY fBUmgŁ
Ú~{]@_`•^ÁÔ[{][}^}c	HÈ
V¦^ææ{ ^}ơ∜Ô^}ơ^¦∕Ô[{][}^}c	FÈG
Ò ^&da&aa¢ÁÙ^¦ça&^	€È
Tãr&^  æ}^[˘∙	€Ï
Ú¦^ç^}cãç^ÁTænje¢}æ)&^	€È
Ù°∙c^{ÁГ[åãa8aeaāį}	ŧ
Ø[¦&^{ aaa)	€ÈE
HchUʿGmghYa ˈ9ei]jUYbh	ÎÈ

#### 5 bh]W]dUhYX`8 ck b H]a YZcf:]gWU/MYUf&\$&&\$

Úč{]@[č•^ Ô[{][}^}c	IÈ€
V¦^æq{^}cÔ^}ơ\¦Ô[{][}^}c	FĚ
Ò ^&cla&aa‡Ù^¦ça&^	GÈ€
Tã&^  æ}^[˘∙	FÈ€
Ú¦^ç^}cãç^Taãjo*}aà}&^	FÈ€
Ù^∙c∿{ T[åãa&æaaậ}}	€Ť
Ø[¦&^{ and }	FÈ€

#### HUV`Y'%&'\*

#### JC7 `A Ugg`@cUX]b[ `Giaa Ufm : ]gWU`MYUf`&\$% H; FGŽCI& 5fXYb'<]``gžA]bbYgcHJ

КY.	DYfWYbh7cbhf]Vih]cb hc`JC7 AUgg`FYacjU	:M&\$% HchƯ`DcibXgʻJC7g AUggʻFYacjYX
ÓF	HËLÃ	ÎÎË
ÓĊF	€È€Ã	€È€€
ÓН	ÆÊÐÃ	HÊF
ÓI	HÈEÃ	í î 🗎
ÓÍ	ÍÈEÃ	JFÈ
ÓÎ	FÈHÃ	GÈH
ÓÏ <sup>F</sup>	Ĩ	€È€€
ÓÌ	€ÈHÃ	ÍÈÊ
ÓJ	FÈĂ	НÈ
ÓF€ <sup>F</sup>	€Ì€Ã	EÈEE
ÓFF <sup>F</sup>	€Ì€Ã	€È€€
ÓFG <sup>F</sup>	€È€Ã	€È€€
ÓFH	GÈLÃ	I HÈ
ÙÔF	ÌÈÃ	FÎ F
ÙÔG <sup>F</sup>	€Ì€Ã	€È€€
ÙÔH <sup>F</sup>	€È€Ã	€È€
ÙÔI <sup>F</sup>	€È€Ã	€È€
ÙÔÍ	ΪΗÈĒÃ	FÊHGF
:]gWU`MYUF &\$% HcHJ`flVgŁ		%ã, \$+
8 Uj`mi5 j YfU[Y flVg#XUn4L		) '\$

#### 8 Uj`mi5 j Yf U[ Y flVg#KUntL

Þ[ c∿∙K

#### HUV`Y'%&'\*

#### JC7 ʿA Ugg @cUX]b[ʿGiaaUfm :]gWU ʿMYUf &\$% H; FGžCI& 5fXYb <]`gžA]bbYgcHJ

#### <]ghcf]WU<sup>·</sup>HchU

:]gwU`MYUf		DcibXgʻJC7`AUgg FYacjYX
GEFJ		FÊÉ€Ï
GEFI		FBFF
G€FI		FÐI I
G€FI		
		F#11
GEFFI		GEELG
GEFG GEFE		
GEFE		∩ ≆ lî
GEEL		CÊÎ Î
GEEÌ		GÊGIG
GEEÏ		GÉÉ
G€€Î		GÉÉÍG
G€€Í		GÊÎH
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G€€H	Ç2ã•oÁ^ælÁįÁ^&[}~ãč¦^åÁ^•ơ{ D	HÊ€IF
G€€€G		GÉÉÍG
G€€F		HÊÊFÌ
G€€€		IEJJ
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FJJI		lt±r€
FJJI		F€ELII
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FJJI		r Lei e Cefei í
ELIG		GĘĠ
FJJE		GÎÊ΀
FJJ€		FÌÊ€€Í
FJÌJ	025ã•oÁ^æłÁ,-Á≚∥Á&æ‡^Á^•o^{{D	FJḖF€
FJÌÌ	з <u>с II - т</u> - с <del>–</del>	IÊ€€
FJÌΪ		GÊ€€
HcHJ		88\$\$ž(*+

#### HUV`Y`%&!+

#### JC7 '7 cbWYbhfUhjcbg']b'H; FG'91 hfUWhjcb'K Y`g :]gWU'MYUf'&\$% H; FGžCI& 5 fXYb'<]`gžA]bbYgchU

				%2%2/3HfjW`cfcYA UbY	%⊉48 JW`cfcYh LbY	%2%18 JW `cfcYh YbY	%walsjw `cfcYh ubY	Wjg!%≊e!8 jw`cfcYh YbY	HYrfUW `cfcYh YbY	Hf]W`cfcYh YbY
@cWUhjcb	5`]Ug	8 UhY	8 i d	±[ #@	±[ #@	±[ #@	±[ #@	±[ #@	±[ #@	±[ #@
€HØH€G	ÓF	FGÐÐBG€FÌÁ		IÈ€Á	€ÈËGÁRÚÁ	FÈ€Á	ŁÁFÈ€Á	НÈА́	GÈ€Á	ÎJÁ
€HØH€G	ÓF	Î₽FGEG€EFJÁ		HÈÈÁ	€ÈÈFÁRUÁ	€ÈÐÍÁRÚÁ	ŁÁFÈ€Á	HÈÈÁ	FÈÉÁ	ÎÏÁ
€HØH€H	ÓG	ÎÐFHBG€€FJÁ		ŁÁFÈ€Á	ŁÁFÈ€Á	FÈÁ	€ĽĚHÁRÚÁ	FÈÁ	€ÈÌIÁRÚÁ	ĠÁ
€HØH€I	ÓН	FGÐÐBG€FÌÁ		ŁÁFÈ€Á	€ÈHÁRÚÁ	€ÈÈHÁRÚÁ	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	HÈÈÁ
€HØH€I	ÓН	Î⊞FGED€EFJ		ŁÆRÈ€Á	€ÈÈFÁRŰÁ	€ĽĚIÁRUÁ	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	НÈЭÁ
€HØH€Í	ÓI	FGÐÐ80€€FÌÁ		ÍÈÁ	GÌÈÁ	GÈLÁ	ŁÁFÈ€Á	FÈÍÁ	ŁÁFÈ€Á	ΪΙÁ
€HØH€Í	ÓI	Î₽FGED€EFJÁ		ΪÈΕÁ	GÈÁ	GÌÈÁ	ŁÁFÈ€Á	FÈÁ	ŁÁFÈ€Á	ΪΪÁ
€HØH€Î	ÓÍ	FGÐÐBGEFÌÁ		GÌFÁ	GÊÂ	GÌÈÁ	ŁÁFÈ€Á	€ÈJ€ÁRÚÁ	HÈËÁ	ÎÏÁ
€HØH€Î	ÓÍ	Î₽FGEG€EFJÁ		GÈGÁ	GÊÂÁ	GĚÍÁ	ŁÁFÈ€Á	€ÈƏÏÁRŪÁ	HÈÈÁ	ÎÌÁ
€HØH€Ï	ÓÎ	FGÐÐBG€FÌÁ		€ÈLIÁRÚÁ	€ÈH ÁRÚÁ	€ÈÈJÁRŰÁ	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ĠÁ
€HØH€Ï	ÓÎ	ÎÐFHED€EFJÁ		€ÈÏÁRÚÁ	€ÈHÏÁRUÁ	€ÈÌJÁRÚÁ	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ĠÁ
€HØHFG	ÓFF	ÎÐFHED€EFJÁ		ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á
€HØHFJ	ÓFH	FGÐÐ80€€FÌÁ		HĒĖÁ	FÈFÁ	€ÈÌGÁRÚÁ	ŁÁFÈ€Á	ÎÈHÁ	€ÈÈHÁRUÁ	F€€Á
€HØHFJ	ÓFH	FGÐÐ65€FÌÁ	Ö	HÈËÁ	FÈGÁ	€ÈĴÎÁRŰÁ	ŁÁFÈ€Á	ÎÈÁ	€ÈËÏÁRŪÁ	FF€Á
€HØHFJ	ÓFH	Î⊞FGED€EFJÁ		GÈLÁ	€ÈJÏÁRUÁ	€ËÌÌÁRUÁ	ŁÁFÈ€Á	ΙÈÁ	€ÈHI ÁRÚÁ	ΪΪÁ
€HØHFJ	ÓFH	Î⊞FGED€EFJÁ	Ö	GÈLÁ	€ÈÌÍÁRÚÁ	€ÈÈÎÁRUÁ	ŁÁFÈ€Á	ΙÈÁ	€ÈHÁRÚÁ	ΪΪÁ
€HWH€F	ÙÔF	FGÐÐBG€FÌÁ		ЫÁ	ÌĒÁ	ΪÈΕÁ	ŁÁLÈ€Á	FÏ €Á	ŁÁLÈ€Á	GF€€Á
€HWH€F	ÙÔF	Î₽FHEQ€EFJÁ		I €Á	ΪĒΪÁ	ÏÈGÁ	ŁÁÍÈ€Á	F΀Á	ŁÁÍÈ€Á	GG€€Á
€HWHFÏ	ÙÔÍ	FGÐÐ Ð5€FÌÁ		ÌÌ€Á	Ĝ Á	I€Á	ŁÁÍÈ€Á	ÌĖ̈́Á	ÍÈGÁ	HF€€Á

#### HUV`Y`%&!+

#### JC7 7 cbWYbhfUhjcbg"]b"H; FG'91 hfUWNjcb"KY`g :]gWU"MYUf"&\$% H; FGžCI& 5 fXYb"<]``gžA]bbYgchU

				%2/2/1HJW`cfcYh UbY	%2018 JW `cfcYh UbY	%2%38]W`cfcYh YbY	الله کې کې کې کې کې کې کې کې کې کې کې کې کې	Wgg!%2&8.]W`cfcYh YbY	HYHUW`cfcYh YbY	Hf]W`cfcYħYbY
@cWUhjcb	5`]Ug	8 UHY	8id	±[ #@	±[ #@	±[ #@	±[ #@	±[ #@	<b>±[</b> #@	<b>±[</b> #@
€HWHFÏ	ÙÔÍ	ÎÐFHBG€FJÁ		JG€Á	ĠĂ	í ì Á	ŁÁ <del>⊾</del> €Á	F€Á	IÈÌÁRÚÁ	HI €€Á
ÚRÀH€J	ÓÌ	FGÐÐBG€FÌÁ		€ÈĤÍÁRÚÁ	€ÈHÎÁRUÁ	€ÈÈHÁRÚÁ	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ÌÈHÁ
ÚRÀH€J	ÓÌ	Î₽FGEG€EFJÁ		€ÈFFÆŰÁ	ŁÁFÈ€Á	€ÌH€ÁRÚÁ	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ÎĖĖÁ
ÚRÀHF€	ÓJ	FGÐÐBG€FÌÁ		FÈFÁ	FËÁ	FËÁ	ŁÁFÈ€Á	€ÈÈÍÁRÚÁ	ŁÁFÈ€Á	H€Á
ÚRÀHF€	ÓJ	FGÐÐBG€FÌÁ	Ö	FÈGÁ	FËÁ	FËÁ	ŁÆrÈ€Á	€ÈÈIÁRÚÁ	ŁÁFÈ€Á	HFÁ
ÚRÀHF€	ÓJ	ÎÐFHBG€EFJÁ		FÈFÁ	FË ÁRT ÙFHH	FËÁ	ŁÁFÈ€Á	€ĽĚJÁRŪÁ	ŁÁFÈ€Á	H€Á

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Ö ËØã∿|åÁÖč]|ã&æe∿

ÇÀÁĮ ||[ , ]] \* ÁRT ÙÁār Ása8cč æļÁà Á^&[ ç^¦^D

#### Úæ\*^ÆĄ́~Æ

#### HUV`Y`%&!,

#### ;fcibXkUhYf'EiU]hm8UhU :]gWU'MYUf'&\$% H;FGžCI& 5fXYb'<]``gžA]bbYgchU

			%2/204Hf JW `cfcYh UbY	%22,48 JW `cfcYh UbY	%⊉48 JW`cfcYh YbY	%248]W`cfcYhUbY	V¶g!%≦&⊔8]WV`cfcYh\YbY	HYHUW `cfcYh YbY	Hf]W`cfcYh YbY
H; FC	3 <sup>-</sup> 7`YUbid`@∕	ΊΥ <sup>ft</sup> ∕Ł	<b>&amp;\$</b> \$	+\$	* '\$	( "\$	+\$	) '\$	) '\$
@cWUhjcb	8 UhY	8 i d	±[ #@	±[ #@	±[ #@	±[ #@	±[ #@	<b>±[</b> #@	<b>±[</b> #@
€HŠÌ€G	Î∰ƏÌBO€€FJÁ		ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÆRÈ€Á	ŁÁFÈ€Á	FÈÁ
€HŠÌ€Î	Î⊞FÏEQ€EFJÁ		€ÈIJÁRÚÁ	ŁÁFÈ€Á	€ĽĚÌÁRŪÁ	ŁFÈ€	ŁÁFÈ€Á	ŁÆrÈ€Á	H€Á
€HTÌ€G	Î∰ƏÌBG€EFJÁ		ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ÏÈGÁ
€HTÌ€Î	Î⊞FÏED€EFJÁ		€ÈÈIÁRÚÁ	ПÁ	ĠÁ	€ĽĚÏÁRŪÁ	JÈÁ	ŁÁFÈ€Á	I F€Á
€HW€JH	Î⊞FÏED€EFJÁ		ÍÏÁ	€ĽĚ GÁRÚÁ	IÈÁ	ŁÁFÈ€Á	GÈLÁ	ŁÆrÈ€Á	FG€Á
€HW€JH	Î⊞FÏEQ€EFJÁ	Ö	ÍÎÁ	€ĽĚIÁRUÁ	ΙĚ	ŁÁFÈ€Á	GÈLÁ	ŁÆrÈ€Á	FG€Á
€HW€JJ	Î∰TIBĐ€FJÁ		€ĽĚGÁRÚÁ	ŁÁFÈ€Á	ŁÆFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÆrÈ€Á	FĚÁ
€HMÎÏÏ	Î⊞FÏED€EFJÁ		ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÆFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÆrÈ€Á	ŁÁFÈ€Á
€HWÏ€Ì	Î⊞FÏEQ€EFJÁ		FĚ Á	ŁÆÈ€	€ÈÈFÁRUÁ	ŁÁFÈ€Á	ŁÁFÈ€Á	ΪÈÁ	ŁÁFÈ€Á
€HWÌ€F	Î₽ÐFJEQ€€FJÁ		ŁÆFÈ€Á	ŁÆRÈ€Á	ŁÆRÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	FI Á
€HWÌ€Î	Î⊞FÏEQ€€FJÁ		ŁÁFÈ€Á	€ĽĚÏÁRUÁ	€ÈÈÎÁRUÁ	ŁÁFÈ€Á	ŁÁFÈ€Á	€ÌË€ÁRÚÁ	HHÁ
€IR€ÏÏ	Î∰TIBĐ€FJÁ		€ÈÌIÁRÚÁ	GÌHÁ	GÈHÁ	ŁÁFÈ€Á	€ÈÈ GÁRÚÁ	ŁÆrÈ€Á	ÍÌÁ
€I WÏ FF	ÎÐFJEO€EFJÁ		ŁFÈ€	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÆrÈ€Á	ŁÁFÈ€Á
€I WÌ €G	Î∰ƏÌBG€€FJÁ		ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÆrÈ€Á	€ÈÈ€ÁRÚÁ
€WÌ€Î	Î∰ƏÌBG€€FJÁ		€ÈÌÍÁRÚÁ	FÈÁ	FÈÁ	ŁÁFÈ€Á	€ĽĚIÁRŪÁ	ŁÆRÈ€Á	I€Á
€WÌ€Î	Î∰ƏÌBG€€FJÁ	Ö	€ÈÈJÁRÚÁ	FÈÁ	FÈHÁ	ŁÁFÈ€Á	€ĽĚÍÁRŪÁ	ŁÆRÈ€Á	I€Á
€IWÌHH	Î⊞FÏED€EFJÁ		ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÆrÈ€Á	€ĽĚ€ÁRÚÁ
ÚRÀÌ €Î	Î∰ƏÌBG€FJÁ		ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÁFÈ€Á	ŁÆrÈ€Á	FGÁ

Þ[ c∿∙K

#\* Ë2Ô|^æ)`] Á^ç^|• ÁĮ ¦Á/ÕÜÙÁæ'^Á¦[ { Ás@ ÁUWGÄÜUÖËÄÛ@æå 引 \* Áŋ å 38ææ^• Á×¢&^^å^} & Å@ Á&|^æ)`] Á^ç^|È Ö Ë428\*|åÄÖ`] |38æe^

ÁQÀÁĮ III , ð) \* ÁRŠÁST Ása&č æ¢ÁŘ Á^&[ ç^¦^D

#### HUV`Y`%&"-

#### Gia a UfmiCZCI & 8 YYd'; fcibXk UhYf'A cb]hcf]b['F Yei]fYa Ybhg H; FGžCI & 5 fXYb'<]`gžA]bbYgchU

F Ya YXm7 ca dcbYbh	Acb]hcf]b[¨FYei]fYaYbhg	<b>⊧a</b> d`Ya Ybh]b[ `DUfhm	8 cWiaYbhgʻ7 cbhUjbjb[ʻh\Yʻ A cbjhcfjb[ʻD`Ub
ÀFP^妿ĕ ã&kố0[}œãnj{^}oÁæ)åÁ	æÈYæe^¦Á^ç^ •ÁtĺÁs¦æçÁ&[}([`¦Á(æ])•Á@([,ā])*	Þ[¦c@{])ÁÕ¦`{{æ})Á	Ö^^]/∜: [`}å,æe^¦A([}ãa[¦ā)*A) æ)Á
Tæ∙kÜ^{[çæ‡	@妿ĭ a&A[}^Átj-Á&æa];č¦^	Ù]æ&∿ÁÛ^∙c∿{•E0E{^	ā),ÁOB;}`æ),ÁÜ^][¦c
	àÈÚ˘{]ā]*Áç[ ˘{^•Áxa) åÁæe^•Á[¦Á&[{]æ¦ãe[}Á{	Þ[¦c@[]ÁŨ¦`{{æ})Á	Ö^^]Á*¦[`}å,æe^¦Á([}ãq[¦ã),*Á, æ),Á
	å^•ã"}Áæe^•	Ù]æ&∿ÁÛ^∙c∿{•ĐŒ{^	ã),Á03;}`æ4ÁÜ^][¦c
	&ÈQ,- ĭ^}oÁee)åÁ∿¢dæ&aãį}Á,^  Á,æer\¦Áĭæ4ãĉÁų[¦Áį,ç^¦æ4	Þ[¦co@[]ÁÕ¦č{{æ})Á	Ö^^].Át¦[ĭ}å,æe∧¦Á([}ãq[¦ā);*Á, æ);Á
	{æ∙Á^{[çæ4Á&a4&&` æeāį}∙	Ù]æ&∿ÁÙ^∙c∿{•E0E{^	ā),Á035;}ĭæ4ÁÜ^][¦c
ÀG Õ¦[`}å, æe^\Á/¦^æe{ ^}c	″ U`dậ∧åÁa^∥[,		
ÀH V¦^æ^åÁY æ^¦ÁÖã&@e*^	´´ Ò `^}ơ4;[}ã4[¦ã);*Á4[Áç^¦ã-Áæeccaā);{ ^}ơ4(-Ád:^aæ4(^}c	Þ[¦co@[]ÁÕ¦`{{æ}Á	Ö^^]Á*¦[ĭ}å,æe∧¦Á([}ãq[¦ā),*Á, æ),Á
	¦^``ã^{{ ^}σ	Ù]æ&∿ÁÛ^∙c∿{•E02E{^	ã),ÁO5;}ĭæ4ÁÜ^][¦c
ÀI Šæ);åÁW∙^ÁÔ[}d[ •	″Þ[}^		
ÀÍ Ü^ça?, ÁįÁp^, Á/^&@;[∥[*a?•	″Þ[}^		
ÀÎ Õ¦[ĭ}å,æe∿¦ÁT[}ãa[¦ãj*	æÈYæc^¦Á^ç^∣∙Át[Áů¦æ;Á&[}d[`¦Á(æ]•Á@(,ā)*	Þ[¦co@[]ÁÕ¦`{{æ}Á	Ö^^]Á*¦[ĭ}å,æe∧¦Á([}ãq[¦ā),*Á, æ),Á
	@妿` ã&Á[}^Á(Á&æ]cč¦^	Ù]æ&∿ÁÛ^∙c∿{•E02E{^	ã),ÁO5;}ĭæ4ÁÜ^][¦c
	àÈÕ¦[`}å, æe^¦Á`æ¢ãĉÁ([Áç^¦ãĉÁxecæað){^}ơ{(,-Á& ^æ)Á],	Þ[¦c@?[]ÁÕ¦`{{æ})Á	Ö^^]Á*¦[`}å, æe^¦Á([}ãq{¦ãj*Á, æ);Á
	*[憕	Ù]æ&∿ÁÛ^∙c∿{•E0E{^	ã);Á03;}`æ4ÁÜ^][¦c
Uç^¦æ⋕ÁÜ^{ ^å^	æÈÕ¦[`}å,æe^¦Á`æ¢ãĉÁ{Á;Áç^¦ã-Áæcæa\$){^}ơ{(,-Á& ^æ)Á],	Þ[¦c@[]ÁÕ¦`{{æ})Á	Ö^^]Á*¦[ĭ}å,æe^¦Á([}ãa[¦ã)*Á) æ)Á
	*[憕	Ù]æ&∿ÁÛ^∙c∿{•ĐŒ{^	ã)Á05;}ĭæ)ÁÜ^][¦c

#### HUV`Y`%&'%\$

#### %ấ(!8]clUbY7cbW7blfUhjcbg`]b'9llfUWMjcb'KY`g :]gWU`MYUf'&\$% H;FGžCl& 5fXYb'<]`gžA]bbYgcHJ

		GWYYb]b[ `7 f]hYf]U	∫fkF@L	🐝 🌾 !8 jci ubY
@cWUhjcb	5`]Ug	8 UHY	8 i d	±[ #@
€HØH€G	ÓF	Î⊕FGBG€EFJÁ		FĚÁ
€HØH€H	ÓG	ÎÐFHBG€EFJÁ		€ÈGFÁ
€HØH€I	ÓН	Î₽FGEG€EFJÁ		ÍÈÁ
€HØH€Í	ÓI	Î₽FGEDGEFJÁ		GJÈHÁ
€HØH€Î	ÓÍ	Î₽FGEQ€EFJ		FGÁ
€HØH€Ï	ÓÎ	Î₽⊽HBO€€FJÁ		F€ÈCÁ
€HØHFG	ÓFF	ÎÐFHBO€€FJÁ		ĤÊÁ
€HØHFJ	ÓFH	Î₽FGEDGEFJÁ		HÈËÁ
€HØHFJ	ÓFH	Î₽FGEDG€FJÁ	Ö	HÈLÁ
€HWH€F	ÙÔF	Î₽FHBO€€FJÁ		GGHÌĂ
€HWHFÏ	ÙÔÍ	Î₽FHBO€€FJÁ		FI ÈFÁ
ÚRÀH€J	ÓÌ	Î₽FGED€€FJÁ		JÈÁ
ÚRÀHF€	ÓJ	Î₽FHBO€€FJÁ		foeii árt ùî í röi já

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- PÜŠ ĔŔ₽^æ¢o@ÁÜã\ÁŠąĩãóĄŢąĨ}^•[œæŔÖ^]æ\d(^}o∱, Á₽^æ¢o@DÈ ÁÙ@æåậ\*Áşiå3&ææ\*•Á\¢&^^å^}&^Á\á&@A?ÜŠ
- Ö ËØã∿|å ÁÖč] |ã&æe∿
- RT ÙÀ ËÁÜ^•×' |o/\$vē`Á` ædpãæð å Ásee Át• cāj æze^ å Ási`^Ási[ Á; čd^āj \* ÁT ÙÁ^&[ ç^¦^È Á/@:Ái[ ,jī] \* Á; č{ ^la8ædyÁsæt`^/ávē Asee•[8aæze^ å ÁA ÁT ÙÁ^&[ ç^¦^È
- RÖÀ ËÁÜ^•` ĺdĺáš Áľ ædáðað á Áse Át• dá æz á Ási ^ Ás[ Át d^ át \* ÁÜÚÖÁşæti ^ È Á/@ Át III[, át \* Át { ^ la BædyÁşæti ^ Ási As@ Áse • [ 8áæz ^ å Át ` d^ át \* ÁÜÚÖÁşæti ^ È

#### %a(!8]clUbY7cbWVblfUh]cbg`]b`Acb]hcf]b[`KY`g : ]gWU`MYUf`&\$% H; FGZCI& 5fXYb<sup>·</sup><]``gžA]bbYgcHJ

			ظ 18]دا لەY
GV	<b>W</b> YYb]b[ '7f]h¥f]U	ífk F @L	%\$
@cWUhjcb	8 UhY	8id	±[ #@
€HŠÌ €G	Î⊕FÌED€€FJÁ		€ÌHÁ
€HŠÌ €Î	ÎÐFÏED€EFJÁ		FHĚÍÁ
€HTÌ€G	ÎÐFÌED€€FJÁ		€ÈÊÂ
€HTÌ€Î	Î⊞7ÏED€EFJÁ		FÎ ÈHÁ
€HW€JH	Î⊞7ÏED€EFJÁ		CÌÈÁ
€HW€JH	Î⊞7ÏED€EFJÁ	Ö	GÌHÁ
€HW€JJ	ÎÐFIED9€FJÁ		ŁÁEÈEÏÁ
€HMÎÏÏ	Î⊞7ÏED€EFJÁ		€ÌHGÁ
€HWÏ€Ì	Î⊞7ÏED€EFJÁ		FÈHÁ
€HWÌ€F	ÎÐFJEЀFJÁ		€ÈGÁ
€HWÌ€Î	Î⊞7ÏED€EFJÁ		JÈÁ
€R€ÏÏ	ÎÐFIED9€FJÁ		FGĚÁ
€I WÏ FF	ÎÐFJEЀFJÁ		ΪĒ̈́Á
€I WÌ €G	Î⊕FÌED€€FJÁ		€ÌHÁ
€WÌ€Î	Î⊕FÌED€€FJÁ		FHÈLÁ
€WÌ€Î	Î⊕FÌED⊖∈FJÁ	Ö	FHÈCÁ
€IWÌHH	Î⊞7ÏED€EFJÁ		FGËLÁ
ÚRÀÌ €Î	Î⊕FÌEQ€EFJÁ		FI ÈGÁ

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- $PUS = EAP^{a} = 0$
- Ö ËØā\|åÁÖ`] [a&æe^

#### HUV`Y`% '%

#### ; fcib Xk UhYf EiU]hm/8 UhU : ]gWU`MYUf`&\$% CdYfUV`Y'I b]h'

			%⊉@%HfjW`cfcYh UbY	%2∕&uhr]W`cfcYh UbY	%248 JW`cfcYN UbY	%⊉&8 JW`cfcYN YbY	Wg!%88.18 JW`cfcYh YbY	Hf]W`cfcYh YbY
CI	' '7`YUbid'@	∕jΥ <sup>ft⁄≰</sup>	<b>&amp;</b> \$\$	<u>ب</u>	+\$	* '\$	+\$	) '\$
@cWUhjcb	8 UhY	8i d	±[ #@	±[ #@	±[ #@	±[ #@	±[ #@	±[ #@
€HTÌIÌ	ÎEDEEDEFJÁ		ŁÁFÈ€Á	ŁÁFÈ€Á	€ÈHÏ ÁRÚÁ	€ÈÏÍÁRÚÁ	ÍÈÁ	F€€Á
€IWÌÎH	ÎED€ED€FJÁ		ŁÆĒ€Á	ŁÆrÈ€Á	ŁÆFÈ€Á	ŁÆrĒ€Á	ŁÆĒ€Á	€ĽĚÍÁRÚÁ
€IWÌÎH	Î EDGEEDGEFJÁ	Ö	ŁÆRĒ€Á	ŁÆRÈ€Á	ŁÆRE	ŁÆrĒ€Á	ŁÆRĒ€Á	€ŤĚFÁRÚÁ

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fł⁄k ËÔ (^æ) \* ] Á ^ ç^ (• Á [ ¦Á U WHÁ ± ^ Á ¦ [ { Á @ Á U WHÁ Ü U Ö ĚÁ Ú @eeta 引 \* Á § å & æee • Á \* ¢ & ^ å ^ } & ^ } & ^ A \* Á \* Á @ Á & / æ) \* ] Á ^ ç^ (È Ë428 |å ÁÖ ] | 88 æer Ö

RÚ

#### HUV`Y`% "&

#### A Ubb!?YbXU``GHUhjghjWU`GiaaUfm : ]gWU`MYUf`&\$% CdYfUV`Y`Ib]h'

	KΥ	? YbXU``G	Bia VYf`cZ8UhU Dc]bhg`	FUk HfYbX	7cbZ]XYbW¥	7 cYZJVJYbhcZ JUiJUbWY	FUk HfYbX 8 YWg]cb	A5FCG <sup>`</sup> 7cbWig]cb	HF7@9 7cbWYbhfUh]cb <sup>`'</sup> &\$%
9 X	[YcZD`i a YK	Ƴ`g							
Е	€HŠÎÏH	ËFG	Î	Ö^&¦^æ∄	JÌ È JÃ	€ÈGÍÌ	Ö^-ą̃iãe^	Ö^&¦^æ∙ậ*	ÎН
Е	€HŠÌIÌ	ËFF	Î	Ö^&¦^æ∙ậ*	JÏ ÈG€Ã	€ÈÊÎHG	Ö^~ąjãe^	Ö^&¦^æaıãj*	HÈH
Е	€IŴÏH	ËΗ	Î	Ö^&¦^æ∄	JJÈTÏ Ã	€ÈGJÎ Í	Ö^~ąããe^	Ö^&¦^æ∙ậ*	GG
Е	€IWÌHG	Ì	Î	Q&¦^æðj*	ÌJÈÌFÃ	€ÈE€EF	Ùcæà ^[¦Þ[Á/¦^}å	Þ[ Á/¦^} å	ÍJ
Е	€IŴIÍ	ËΗ	Î	Ö^&¦^æ∄	ÎIÈE€Ã	€ÌHÍÌ	Ùcæà ^[¦Þ[Á√¦^}å	Ùœà∣^	ΪÈ
Е	€IŴIÌ	Ë	Î	Ö^&¦^æ∄*	JHÈG€Ã	€È JÎ F	Ú¦[àæà∣^	Ö^&¦^æ∙ậ*	Н
Е	€WÌÍI	ËJ	Î	Ö^&¦^æ∙ậ*	JHÈŒÃ	€ÈÏÏÏ	Ú¦[àæà ∧	Ö^&¦^æậ*	ÏÈG
7 Y	bh¥fˈcZD`iaYʻł	۲`g							
Е	€HŠÌÍJ	ËFG	Î	Ö^&¦^æ₿	JÌ È JÃ	€ÈGI€	Ö^~ąjãe^	Ö^&¦^æı∄*	ΙÈ
	€HTÌIÌ	ËFF	Î	Ö^&¦^æ₿*	JÏ ÈG€Ã	€ÈÊÎÌÍ	Ö^~ąjãe^	Ö^&¦^æậ*	F€€
Е	€IWÌÍJ	Ë	î	Ö^&¦^æ₿*	JJĚ FÃ	€ÈÈÌÎI	Ö^~ąjãe∿	Ö^&¦^æ∙ậ*	GÍ

#### Þ[ c∿∙K

EËÆÖ^}[c∿•Áræ{]|^Á^•č|o=Á&[||^&cvå/\$§ÁØŸÁG€FÌ

#### HUV`Y'% "

#### Úæ\*^ÁFÁ{-ÁF

#### Gia a UfmicZ; fcibXkUhYf`Acb]hcf]b[`FYei]fYaYbhg CdYfUV`Y`Ib]h'

	FYa YXm7 ca dcbYbh	Acb]hcf]b[ˈFYei]fYaYbhg	=a d`Ya Ybhjb[ ˈDUfhm	8 c₩ia Ybhgʻ7 cbhUjbjb[ʻh\Y A cb]hcf]b[ʻD`Ub
ÀF	T[}ã{¦^åÁÞæč¦æ4ÁOEcc\}ĭæaãį}	Učdậ,^åAa∿[[,È		
ÀG	Õ¦[`}å,aec^¦ÁT[}ãa[¦ā)*	æÈYæe^\¦Á(^ç^ ∙Á[¦Á`•^Á§i,Áů¦æ;ãj*Á&[}d[č¦ {æ]j•È	Þ[¦c@[]ÁÕ¦`{{æ}}Á Ù]æ&^ÂÛ^∙c^{•	UWHÁT[}ãā[¦ā]*ÁÚ æ)Á§JÁOB;}čæ)ÁÜ^][¦c
		àÈÕ¦[č}å,æe^\'Á;æ{] ã)*Á{[Ád:æ&\Á;! * '^••Á;~ & ^æ)Ë]Áse)åÁseec^}čæaā[}Á;~Á, č{ ^È	Þ[¦@@[]ÁÕ¦`{{æ})Á Ù]æ&^ÂÛ^∙ơ\{•	UWHÁT[}ãā[¦ãj*ÁÚ æ)Á§iÁOE;}čæ)ÁÜ^][¦c
ÀH	Ö¦ą̃lją̃*Á02áçã[¦ã∿∙	æÈ X^¦ãa3&ææa≬}Áo@æe¢å¦ā∥āj* æåçãr[¦ã∿∙æ¦^ājÁ ] æ&∿Áæ)åÁč}&aãį}āj*ÁæeA§jc∿}å^åÈ	Œ{ ^ET ÖP	ÞŒ
UÜ	KUç^¦æ∥ÁÜ^{ ^å^	æÈYæe∿¦Á`æ¢ãĉÁ[[}ã[¦ã]*Á{[Áç^¦ã∻Áæacæa3]{^}c [-Á& ^æ)Ë]Á[æ†≉È	Þ[¦c@[]ÁÕ¦`{{æ})Á Ù]æ&∿ÂÛ^∙c∿{•	UWHÁT[}ãā[¦ā]*ÁÚ æ)Á§IÁOB;}ča‡ÁÜ^][¦c

#### HUV`Y`% "(

#### %ã(!8]clUbY'; fcibXkUhYf'GUad`]b[`FYgi`hg :]g₩U`MYUf'&\$% CdYfUV`Y'Ib]h'

GWYY	∕b]b[ <sup>∵</sup> 7 f]ŀYf]Ư	fkF@c	چې % i8 jcl لby
@cWUhjcb	8 UHY	8i d	±[ #@
€HTÌIÌ	Î EQEEDEFJÁ		€ÌFÁ
€WÌĤ	ÎEDEEDEFJÁ		€ÈEÎÏÁRUÁ
€WÌÎH	ÎE©96809€FJÁ	Ö	€ÈEÎÎÁRUÁ

Þ[ c^∙K

- Ö ËØã∿|åÁÖ`] |ã&æe^
- RÚ ËÜ^•`|o/\$arÁ`æ¢áã?åÁæ•Á\*•cā[ææ^åÁ?ā]&^Ás@Á\$a^c^&cā]}ÅärÁba^|[, c@/Áæbi[¦æag[¦^Á^][¦cā]\*Áā[ãc

# : ; I F9G



উছা ধৰি য়} ^ এৰ [ कि संचित्रको[ \* ] ধৰে উX संचि/ ক্ষণ কৰি দিব উ মিউজ কৰিছে? এইটা মেউতি Ur প:।• মি VOCER প্ৰতিসময় (Ir ^ totain কৰিছে বা কৰে F\* Or ) হল। ল আৰম্ভ 1 কি 111 গ; নামান AM জ দি জৰি মানবাচৰ কিবি।





Öötik ná j) ∧aj [ja klágaDi] "j kút ÖXk0) ∧azvá könkt Ökkösa oklasová könká, ika i v⊷ klá VODENE v Zodenie



ົດສໍາໄກ ສຸ}∧ສຸເ[ja້/ເນິສຸໝໍາ[\*] ເໄດ້ ບັXໄດ້ບ່າ-ສະຈໍາວ່າ ໄດ້ ບັກເຮືອ ດໍນສາຈາໄດ້ ເຊລີບັນຕາ່•ໃຫ້ vôcαແນ່ ຜ4ນັດແລນີ່ມັນ•ະ ດີສາສາລຂອດອີຣີສາຊາ G H ຜາລາເລຫຼະ ' ບຸ , } ^ ສໍາ ບໍ[] າາເ ໍ , ສາສູ - ບານດຊີ ຂໍລໍໄ<del>ມ πາຍອິດຣັກເປ</del>ອ


DUNL.∴.PH755DFFY[9X]pgR&&&\$1\$%P?][ifYS\*!%/iddYfib.]ñ((%/[iH795:M&&% \*alX 8Uh/∴,#%#&&&& H]aY.%)\*.&'DA lgYf.?;DYhYfg

# ØŴÜÙÁHËG ÞÒY ÁÓÜŐPVUÞÁT WÞÓDÚCIŠÁY ÒŠŠÙKÁÝÜÔPŠUÜUÒVPÒÞÒÁY CE/ÒÜÁÛWCIŠQYŸÁ/ÜÒÞÖÙ

ØŸÁGEFJÁKOE;} \* æ¢ÁÚ^¦-{ ¦{ æ} &^ÁÜ^][ ¦c























#### :][ifY'!\* CI & CI %Hf]W(`cfcYh YbY` 7 fcgg'GYWijcb'5!5ĐfBcfh' < UZL

WÈÙÁŒ{ ^ Æ̈́VÔŒÐÉ OEtå^} Á Pāļ• É ATā; }^•[ cæ

@/[YbX

€IR€ÏÏ

ÞÙ

ÞÖ

µ\* £ŠŠ

ÞÕXÖ

ÎJÐFĚ

Y^∥ÁØÖ

Þ[oÁÛæ{]|^å

Tã&¦[\*¦æ{•Á,^¦ÁŠãa^¦





Note: FY 2018 monitoring data are used in the delineation of contaminant plume boundaries but are not included on this figure

### :][ifY'!+ CI & CI %Hf]W(`cfcYh YbY` 7 fcgg GYWijcb 5!5 ĐfGci hi < UZL

WÈJÁCE{ ^ ÆVÔCEDEÚ OELå^}ÁPã∥•ÉATã;}^•[cæ



# @/[YbX

- ÍFGÏÎF Y^∥ÁQÖ
  - ÞÙ Þ[ơÂĴæ{]|^å
  - ÞÖ 05, æ∲ c^ÁÞ[ ớÖ^c^&c^å
  - µ\*ĐŠ T 33% [\*¦æ∳ •Á∖^¦ÁŠãe^¦
- ÞÕXÖ Þædaí}}ædÁÕ^[å^da&A X^¦ca&adÁÖæci{
- Ü^][¦c^åÁçæ]`^ÁãrÁà^ç ^^}Á R c@^Á{^^c@}åÅå^c^&ca{a}}Åã{\_ãtÁ æ)åÁ^][¦œã\*Áãiãc

Note: FY 2018 monitoring data are used in the delineation of contaminant plume boundaries but are not included on this figure

PIKA

ARCADIS



# ØÕŨWÜÒÄHË9 UWFÊÆÞÓÔÕÜÙÁT ŒÙÙÁÜÒT UXŒŠÁ₽ŴVUÜŸ

ØŸÁGEF9ÁK05;} \* æ¦ÁÚ^¦-{ ¦{ æ} &^ÁÜ^] [ ¦c









# @⁄[ YbX

$\oplus$	Ù^æ¦^åÁY^  Æ͡[8ææð]}				
<b>—</b> \$% ')&	Ò¢d æ\$ka‡} Á′ ^  ÁŠ[ &ææ‡] }				
<b>⊕</b> \$%')&	T[}ãt[¦ā]*ÁY^∥ÄŠ[&æeaāį}				
<del>⊖</del> \$% %	Úā^:[{ ^ c^\ k͡S[ &ææā]}}				
F€ \$% %(*	V^dæ&@{[¦[^c@e}}^ÁÔ[}&^}dæaā[}ÁÇu*EŠD				
	FJI Í Á/¦^} &@				
WHINN Sefe VA VAV 7 ch/White Heba 804					

\$% \$',

FËF€Äŵ\*Њ



\$% %

Figure 6-3

FY 2019



Ŭangakinah (ÖDETLÜLÜ)^\*Ödäa∋aGeGe‴eïia2i´l i Ŭar Alzaka EFERAÖÖÖÖLÜ|`{ ^ATaaj´ØŸGeFJÈ;¢å Özaz'ıkā EDEDeGe Vaj ^ıkal KGJIGELÜT Wi^lkasÖÜ/oz'ı•



# : ][ i fY'\*!\* W[g!% 28.18 ]W(`cfcYh\YbY'7 fcgg'GYW]cbg'5 26 27 28

WÈJÁŒ{ ^ ÆVÔŒEÚ Ό^}ÁPã∥•ÊATã;}^•[œe



900

890

880

870

850







@/[ YbX



μ\*ĐŠ Tã&¦[\*¦æ∳•Á∖^¦ÁŠãe^¦ &ã#ËFÊÐËÖ3&@[¦[^c@}}^ÁÔ[}&^}dæaấ]}ÁQu\*EŠDÁ Ù`{ { ^¦ÁΘ€FJ

# :][ifY`\*!+ G]hY`5žW]g!%ã&!8]W(`cfcYh\YbY`KUhYf`EiU`]hmiHfYbXg.`9IhfUWF]cb`KY``g`%H\fci[\`(

V ୢ ଶୢୖ ÁÔãa2t∿ ÁQE{ ^ ÁQE{ { ັ}ãaã₁} • ÁÚ|æ}c OEå^} Á?ã∥• ÉÁT ã₃}^•[cæ



OB3√[}^{ ● Ása) å ÁCEaà¦^çãæcãa[}●K ÒYÁWÁO¢dæ3cãa[}ÁY^|| µ\*ĐŠÁWÁ(ã8√[\*¦æ4]●Á]^¦Áãa^¦



# :][ifY`\*!, G]hY`5 žW]g!%ä&!8]W(`cfcYh\YbY`KUhYf`EiU`]hmiHfYbXg.`A cb]hcf]b[`KY`g

V, ∄, ÁÔãa3∿•Á0E{ ^Á0E{ { `}}ãaã;}•ÁÚ|æ);c OEå^}Á?ã|•ÉÄTã;}^•[cæ



O834'[}^{•Áse}åÁOEaà¦^çãeeaãi}∙K µ\*EŠÁMÁ(ã84'[\*¦æ{•Á}^¦Áãe^¦



# : If i fY'\* !-



OB&¦[}^{ • Áse}åÁOEāà¦^çãæeā∦} • K ÒY ÁMÁÖ¢dæ&cãi } ÁY ^ ||  $\mu^*$  EŠÁVÁ a a [\*] a  $\bullet$  A  $^{+}$  A

# :][ifY\*!% G]hY'5 žW]g!% 28 W(`cfcYh\YbY'K UhYf'EiU']hmHfYbXg. 7 cbh]b[YbWhi@cWUh]cbg V, ā, ÁÔãoà•Á0E{ ^Á0E{ { `} ãoā}}•ÁÚ|æ);c OEå^}ÁPā]•ÉATā;}^•[cæ



OB&¦[}^{ ● Áæ);åÁDēaà¦^çãææã[}●K µ\*EŠÁMÁ(ã&¦[\*¦æ{ ●Á),^¦Áãc^¦





DUNI.:..PH755DFFY[9X]hgP8\$&&\$\$+P+\$%36G]h/7`G]h/D`UbS:M&\$% "a IX 8Uh/.\*#&-#&\$&\$ H]aY.+.)\$.&)5A IgYf.?;DYhYfg



DUN...∵. FH755 DFFY[9X]/ng78&&&\$\$\$+P.+S&SG]hY′7 Dchh/bh]ca Yhf]WA UdS: M&&% "al X 8 UhY." #8⊱#8&& H]a Y.'+.)).(-`5A IgYf."?; DYhYfg



## :][ifY`+!( G]hY`7`7fcgg`GYW¶cb`5!5Đ







<u>.</u>	W]]^¦ÁW}ãó4k W]]^¦ÁW}ãó4G	—	Õ^[ [*3&ÁÔ[}œ&oÁ Çaj∽¦¦^åÁş@e¦^Aåæe@åD	_
	Yæe∿¦Á/æà∣^	ТΥЁН	Y ^  ÁÖÖ	
L	` Ù&¦^^}^åÁ͡Qơ\¦çæ	µ* ĐŠ	Tã&¦[*¦æ{•Á}∧¦ÁŠãã∧¦	F

\_ FÍÁµ\*155ÁÖã•[|ç^åASó^æåÁÔ[}&^}dæaā[}ÁÔ[}q[`¦Á ÇŨ¦[ĭ}å, æz∿¦ÁÔ|^æ);ĭ]ÁSó^ç^|DÁaæe@åÁ,@¦^Á āj-∽¦¦^å

FË Öãr•[|ç^å/Ã5^æå/Áçu\*EŠDÁ Ù`{ { ^¦ÁGEF9

ÞÕXÖ Þædai }æ¢Ő^[å^ca&AX^¦ca&a¢ÄÖæči {

### :][ifY`+!) G]hY`7 `7 fcgg`GYW¶cb`6!6Đ

WÈÙÁŒE{^ÁËVÔŒŒÚ Ό^}ÁPậ∥●ÊATậ}}^●[œe







<u>.</u> :	W]]^¦ÁW}ãơ4F		Õ^[  [ * ã&ÁÔ[ } cæ&cÁ	€ÌH€ÁV	Öãr•[ ç^åÁõs^æåÁûµ≭BŠDÁ Ù`{ { ^¦ÁG€F9
	W]]^¦ÁW}ã¢ÁG		Çaj-^¦¦^åA, @¦^Aåæe@åD	ÞÕXÖ	Þæaấį}æ4ÃÕ^[å^œãkÁX^¦œãæ4ÄÖæeč{
	Yæe^¦Á/æà∣^	ΤΥË	Y ^  ÁÖÖ		
Т	Ù&¦^^}^åÁQc^¦çæ	µ* £Š	Ta&¦[*¦æ{•Áj^\ÅŜãz^¦		

# : ][ i fY`+!\* 8 ]ggc`j YX`@/UX

 $\begin{array}{c} \bigvee_{\hat{a}} \hat{A} \hat{O} \hat{a} \hat{a} \hat{a} \bullet \hat{A} \hat{C} \hat{E} \left\{ \begin{array}{c} \hat{A} \hat{C} \hat{E} \left\{ \begin{array}{c} \hat{a} \\ \hat{a} \\ \hat{a} \\ \hat{A} \hat{P} \\ \hat{a} \\ \hat{a} \\ \hat{A} \hat{P} \\ \hat{a} \\ \hat{a} \\ \hat{A} \\ \hat{A} \\ \hat{a} \\ \hat{A} \\ \hat{A} \\ \hat{a} \\ \hat{a} \\ \hat{A} \\ \hat{A} \\ \hat{a} \\ \hat{a} \\ \hat{A} \\ \hat{A} \\ \hat{a} \\ \hat{a} \\ \hat{A} \\ \hat{A} \\ \hat{a} \\ \hat{a} \\ \hat{A} \\ \hat{A} \\ \hat{a} \\ \hat{a} \\ \hat{A} \\ \hat{A} \\ \hat{a} \\ \hat{a} \\ \hat{A} \\ \hat{A} \\ \hat{a} \\ \hat{a} \\ \hat{A} \\ \hat{A} \\ \hat{a} \\ \hat{a} \\ \hat{A} \\$ 



IYAWA,[}a0;;a,∷A,^|| µ\*EŠŠÁWÁ,a3%;[\*¦æ{,●Á,^¦Áãe^¦







ar @a)^ar @a4\UaUx4)x4)za/41;[b&oral1HFFO911|F02#aze/KARD5A9]a02005/A9EF1a028\*,\^+aUUVEEFFFO911|F0UVEEFD0>E7/0EEFE7D92#(AMUD5A9)A91BA92A94



FFG€ÎÍIFËIHÇÜÚVËDEÚÜDÕQÙËÙÚ€€GÁ/ROBÞÁF€BD€G€











ÞKANÙdVæidutu jali[16%&orali] HaFFGeli (IFaÖataza) Ö^•ā} ACEOCEÓAGEFia231 či∧•aÜU/UEEEFaFGeli (IFQÜÚVEEEFDÖÞE?/CBEEFBÖY ŐÁNU[0Özaz∿KÁRNÞÁGIÁBGEGE









UUN, .:. RH755DRFY[9X]rgR\$&\$\$\$+P%\$\$%56`X[%&&@:VUNjcb`AUdS:M&\$% \*a IX 8UHY.\*#&#&\$&\$ H]aY.,.%.\$,5A IgYf.?;DYNYfg





DUN.:. 114755 D14FY[9X]hgn8\$ & \$\$\$\$\$\$\$\$ \$\$ \$ X[\*\$ & & & H]W' cfcYh\Yb Y'FYgi hgS: M&\$ % "a IX 8 UhY.+#,#&\$ & & H]a Y.+.(\*.))5 A IgYi.?; DYhYfg


DUN,.∵. 14755 D1FY[9X]1g78\$8\$\$\$\$+1P%\$\${\$6`X[%\$&7]g`FYgi`hg5:M&\$% "alX 8UhY.`+#,#&\$&\$ H]aY.`+.)%%%5A IgYf.?;DYhYfg



DUN..:. HP755DHFY[9X]hgH8\$&\$\$\$+P.%\$\$)\$6`X[\*%\$&J]bm`FYgi`hgS:M&\$% "a1X 8UhY.∔##&\$&\$ H]aY.+.)-.('5A igYf.?;DYhYfg









#### <u>LEGEND</u>

	PRIMARY ROAD
	SECONDARY ROAD
	RAILROAD
~ · · ~	DRAINAGE
	BUILDING
	BUILDING REMOVED
<u>[ – – ]</u>	SOURCE AREA

- ACTIVE EXTRACTION WELL LOCATION
- INACTIVE EXTRACTION WELL LOCATION

#### EXTRACTION WELL NAME CROSS REFERENCE

B1	03F302
B2	03F303
B3	03F304
B4	03F305
B5	03F306
B6	03F307
B7	03F308
B8	PJ#309
B9	PJ#310
B10	PJ#311
B11	03F312
B12	PJ#313
B13	03F319
SC1	03U301
SC2	03U314
SC3	03U315
SC4	03U316
SC5	03U317





FFGEÎÍIFËIHQÜÚVËDEÚÜDÕQÙËÙÚ€EÏÁAROD∌ÁFHBD€G€







at ඔ) ^ යා ඔබ/ບඩාර්ට්ස් (ස්)[ 5 හා a් î HaFFGeî Î I Faට් atat ' O^+ a } 2020ගවර්වලට 2021 ` / • වේ ෆ් VieeFaFFGeî Î I FQÜ (VieeFaD) > සි රමයා ( b/ Oaae MákOb Aei Bioese





Øðaĭ`¦∧Á∓GÉÍ



UWGEÁW]]^¦ÁW}ãoÁ ÉÁV¦ã&@[¦[^c@}}^Áæ)åÁFÉEÉÖã[¢æ)^Á@[&[}&^}dæaã]}ÁTæ]ÉÂÙ {{ ^¦ÁGEFJ

# @/[ YbX

a joint venture



Øãtĭ¦∧ÁFGË





art ඔ) ^ යා ඔයාටස්ග්රාන් (ස්); [ හ හං a් î HaFFGeî i | Faට්ri කෙද් ටි ^• ei } යටරාගටශ්ලප i acer i / ^• aටටරාර්සල FaFGeî i | Fçü úvසිල FaFGeî i | Fçü úvසිල FaFGeî i | Fçü úvසිල FaFGeî i | Fçü úvසිල FaFGeî i | Fçü úvසිල FaFGeî i | Fçü úvසිල FaFGeî i | Fçü úvසිල FaFGeî i | Fçü úvසිල FaFGeî i | Fçü úvසිල FaFGeî i | Fçü úvසිල FaFGeî i | Fçü úvසිල FaFGeî i | Fçü úvසිල FaFGeî i | Fçü úvසිල FaFGeî i | Fçü úvසිල FaFGeî i | Fçü úvසිල FaFGeî i | Fçü úvසිල FaFGeî i | Fçü úvසිල FaFFGeî i | Fçü úvසිල FaFGeî i | Fçü úvසිල FaFGeî i | Fçü úvසිල FaFGeî i | Fçü úvසිල FaFGeî i | Fçü úvසිල FaFGeî i | Fçü úvසිල FaFGeî i | Fçü úvසිල FaFGeî i | Fçü úvසිල FaFGeî i | Fçü úvසිල FaFGeî i | Fçü úvසිල FaFGeî i | Fçü úvසිල FaFGeî i | Fçü úvස

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: M'&\$% <sup>`</sup>Ë<sup>`</sup>: M'&\$&' <sup>`</sup>Acb]hcf]b[ <sup>`</sup>D`Ub<sup>`</sup>



5 ddYbX]I '5 '%' : M'&\$% '!': M'&\$&' 'A cb]hcf]b[ 'D`Ub'Zcf'; fci bXk UhYf'A cb]hcf]b[ 'K Y`g' : M'&\$% '5 bbi U`F Ydcfhi Hk ]b'7]h]Yg'5 fa m'5 a a i b]h]cbg'D`Ubhi 5 fXYb'<]`gžA]bbYgcHJ'



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### BchYg.

- ÇÓDÁ Quả aBæer^•Ás@eerÁ@Á{[} ãi[¦ā]\*ÁšerÁs@Á^•][}•ãa ājācî Á{r-Ás@ÁOE{^ÈA
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- ČEDÁ % JÁČCEÁ, ¦ÁÓDÁ\$\^}[C\*•ÁæÁ, æc\*¦Á čæjáčÁæ{] |āj\*Á\$\ A\$@Áæ] [[] | āšæ\*Á, æcčÈÁV@Á^``ā^å&æ}æ^c A\$@A\$@A] ^&ã&A\$@A] ^&ã&A\$@A\$] ^
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ÚÖ	€IWIÏJ			ÜËSÇÖL	ÜËŞÇÖL	ÜËŞÇÖL	ÜËĞÇÖL	ÜËŞÇÖL	FÉæÉÄUÜ	HÉa	TÜÖ025Å^&[{{ ^}å^åÅæ}}}`æ‡Å*æ{] ā)*
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# 7 ca a Ybhg

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Note: All of	the Site I shallow g	roundwater wells were sealed in FY14. Follo	wing soil r	emediation	under Build	ding 502, oi	nly 01U667	' was re-ins	talled (with annual	sampling).	
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# 5 ddYbX]I <sup>·</sup>5 '% : M'&\$% '!': M'&\$& A cb]hcf]b[ 'D`Ub'Zcf'; fci bXk UhYf'A cb]hcf]b[ 'K Y`g :MT&\$% `5bbiU`FYdcfh Hk]b`7]h]Yg`5fami5aaib]h]cbg`D`Ubh 5fXYb'<]``gžA]bbYgcHJ

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l b]ł	K Y`` <b>≓</b> 8 "	7 caacb BUaY	Бспід			>1 D1 0.70			KUh¥f`EiՄ]hn	K Uh¥f`@Yj Y	
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	K	Y <sup>™</sup> =bZcfaUhjcb	Rolla	Si bV'0/	SI hV'8¢	SI 6V 80/	51 bV 88	SI bV'8	DifdcgY:cf	Acb]hcf]b["	
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# 7 caa Ybhg

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### 5 ddYbX]I <sup>·</sup>5 '% : M'&\$% '!': M'&\$& A cb]hcf]b[ 'D`Ub'Zcf'; fci bXk UhYf'A cb]hcf]b[ 'K Y`g : M'&\$% <sup>`</sup>5 bbi U`F Ydcfh Hk]b`7]h]Yg`5fami5aaib]h]cbg`D`Ubh 5fXYb'<]``gžA]bbYgcHJ

	K Υ``⊫bΖcfa Utjcb		Dala	Dally h V'0/	SI KV'9¢	SI 6V 89/	- i hV'99	SI DV 88		Di fdcgY': cf'Acb]h		Z oo o Viska
l b]r	K Y`` <b></b> #8 "	7 ca a cb ƁUa Y	вспігу		>ιυτοφ				KUhYf`EiU`]hn	KUhYf`@YjƳ		
ÚÔ	€IWÌHG			Ē	ÛËŠÇOE	Ē	ÛÊŠÇŒ	Ē	UÜ	GÉx	Ô[}α3j*^}&`ÁOB&caaj}}ÁĮ¦Á⁄2Ÿ€Ì	
ÚÔ	€IWÌIÍ			Ē	ÛÊŠÇŒ	Ē	ÛËŠÇCE	Ē	UÜ	GÉx	Ô[}αậ,*^}&`ÁŒ&cāį}Áį¦Á⁄2Ÿ€Ì	
ÚÔ	€IWÌIÌ			Ē	ÛÊŠÇŒ	Ē	ÛËŠÇCE	Ē	UÜ	GÉx		
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ÚÔ	€IWÌÍI			Ē	ÛÊĞÇQE	Ē	ÛËŠÇCE	Ē	UÜ	GÉx		
ÚÔ	€IWÌÍJ			Ē	ÛÊĞÇŒ	Ē	ÛËĞÇE	Ē	UÜ	GÉx		
ÚÖ	€IWIÏ€			Ē	ÜËŞÇDE	Ē	ÜËŞÇE	Ē	UÜ	GÉx		
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ÚÖ	€IWİÏI	HG WI		Ħ	Ħ	Ē	Ē	Ħ	Ē	Ē	Œaæ)å[}^åÅØŸ€J	
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ÚÔ	ÍG€JHF	ÞÓT ÁRH		Η̈́	Ē	Η̈́	Ē	Η̈́	Ē	Ē	OEaæ)å[}^åÁØŸ€Ï	
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(Entries und	der "Notes" refer to	the well inventory category)										
Ë	G€€FÌ€	V[ } Æ ÅÔ[ č } dˆ ÅÕ[   ÅÔ[ č ¦ • ^	Fà	ΗË	ÛCÓD	Ē	Ē	ΗË	Y^  ÁQ2c^}d[ ^	Ē	GGÏJÁTæl•@ælÁØEc∧	
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Ē	GHIHÌ	Ó[•^	Fà	ΗË	Û¢ÓD	ΗË	Ē	ΗË	Y ^   ÁQ ç^ } d   î	Ē	FÍÏÍÁFIc@ÁOEç∧Á⊳Y	
Ē	GHIGF	ÓãiÔ ^æ)ÁQÓãiÔ@{D	Fà	ΗË	Û¢ÓD	ΗË	Ē	ΗË	Y ^   ÁQ ç^ } d   î	Ē	GFÍ FÁT č∙æ} <sup>*</sup> ÁÖ¦	
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ΕË	IHHGUÌ	V[,} <b>Á</b> BÁÔ[ĭ}d^ÁÕ[  <del>/</del> Ô[ĭ¦•^	Fà	ΗË	ÛÇÓD	ΗË	Ë	ΗË	Y ^  ÁQ,ç^} d  ^	Ē	GGÏJÁTæ∳@ællÁ0E;^	
Ē	Í €J€Í G	Ù@ā,^¦∙Á₽[•]ãaæ	Fà	Ē	ÛÇÓD	Ē	ĒË	Ē	Y^  ÁQ2ç^}d[ ^	Ē	G€GÍÁÖÁÜãç^¦ÁÜå	
Ē	ĺHÏÌ€F	Tãã, æ∂ÁQ,åĭ•dãæa;	Fà	ΗË	Û¢ÓD	ΗË	Ē	ΗË	Y^  ÁQ,c^}d; ^	Ē	IÏÍJÁJ åÁP, ^Â	
Ē	ΪÍÎ <b>GHÎ</b>	CIESce)	F&	ΗË	Û¢ÓD	ΗË	Ē	ΗË	Y ^   ÁQ ç^ } d   î	Ē	FÍ€ÁGÌ c@ÁQE_^ÁÙÒ	
Ē	WÞS€ÍÍH€ÏF	Ó^ å^} ÁÜãç^¦ÁÚ¦[]^¦œð•ÉŠŠÔ	Få	ΗË	Û¢ÓD	ΗË	Ē	ΗË	Y ^   ÁQ ç^ } d   î	Ē	GÍ€IÁGÏc@ÁÖE;^}`^Á>Ò	
ĒË	G€€FÏÎ	Yæå[¦-ÁÚæ]^¦ÁÚ¦[åĭ&œ	Gà	Ē	Û¢ÓD	Ē	Ē	Ē	Y^  ÁQ,ç^}d;  ^	Ē	GGHÎ ÁT ^¦d^ÁŒÇ^	
ĒË	G 1€€ï	Yæ¢{}ÊÝ[}ã	Gà	Ē	Û¢ÓD	Ē	Ē	Ē	Y^  ÁQ,ç^}d;  ^	Ē	IIÍHÁU åÁP, ^ÁF€	
ĒË	Ù€€€€G	Tãã æ}åÁPã∥∙ÁÔ[ັ}d^ÁÔ ĭà	Gà	Ē	Û¢ÓD	Ē	Ē	Ē	Y^  ÁQ,ç^}d;  ^	Ē	G€€FÁÞÁØ″ @æ(ÁÙc	
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Ē	GHÎIHJ	Yæ¢å[¦~ÁÚæ]^¦ÁÚ¦[å Šæ•	G&	Ē	Û¢ÔD	Ē	Ē	Ē	Y^  ÁQ,ç^}d[  ^	Ē	GGÍ€ÁY æàæ @ÁQĘ^	

; YbYfU`BchYg. V@Á,^¢c4(abb;lÁae(]|ð)\*Á∿ç^}c4{¦ÁY ^||Á0Q;ç^}d[¦^Á, ð|Áa∿ÁajÁR\*}^ÁðÆ\*}AÆ O⊞Á(Á∞ÁÚã∞ÁQá;@eoph[,Á\*¦[`}å,æe∿¦Á,^||•Á,^¦^Á<æphåÁajÁØŸFIÈÁ



### 5 ddYbX]I '5.& : M&\$% !: M&\$&' 'A cb]hcf]b[ 'D`Ub'Zcf'FYa YX]U'HfYUha YbhiGmghYa g : M&\$% 5 bbi U`FYdcfh Hk]b'7]h]Yg'5fa m5a a i b]h]cbg'D`Ubh 5fXYb'<]``gžA]bbYgcHU



@cWUhjcb	GUa d`]b[ ˈ: fYei YbWt	DUFUa YhYfg
CI% <sup>™</sup> 8YYd'; fcibXkUh¥f <sup>™,∉D</sup>		
Ò¢clæ&cąį}ÁY^∥∙Á⊳ÓTÀIÊÁAFIÊ&ea)åÁAFÍ	ĔĂT[}c@¢	ËÁÚٽ{]ậ}*Áx[ ǐ{^∙
Ça) åÁa;∳[Á≂ÓT ÀHÊÂĂÍÊ Áa) åÁÅÎD	ËÄT[}c@pî	ËÁYæe^∖¦ÁÛĭæ¢ãĉÁ <sup>GD</sup>
ÚÕŒĐÁÒ∤ັ^}c	ĔĂT[}œ¢	ËAY æe∿¦ÁÛĭæ¢ãĉÁ <sup>GD</sup>
CI&:G]hY`?`FYaYX]U`5Wh]cb		
Ò¢dæ&c∿å/Õ¦[`}å,æe∿¦	ËÄT[}c@()	ËÁÚٽ{]āj,*Áx[ ĭ{^
V¦^æa{ ^}ơÂÛ^∙ơ^{ ÁÔ⊶ ˘^}ơÂĨUఀcæ‡ ÁHJFÁÇ€F€Dá	ËÂÛ^^ÁOE,]^}åã¢ÁOEEH	ËÂÙ^^ÁCE;]^}åã¢ÁCEÈH
CI& "H755D'; fcib XkUhYf'FYWcjYfmGmghYaʿfH; FGŁ		
Ò¢dæ&cąį}Á/^  ∙	ËAT[}c@)	ËÂÚĭ{]ậ}*ÁX[ ĭ{^∙
	E4U^{ atCl; } ae  Ë4Û^{ atCl; } ăe ^	EAY æe∿¦AÛčæjãčA <sup>GE</sup>
V¦^æa{ ^}ơÅÜ^∙ơ^{ ÁQ; ⊣̆^}c	ËAT[}c@	ÊÂÛ`{] ĝi*ÂX[ `{^∙
	ËÄT[}c@¢	EAY æe∿¦ÁÛ ĭækjācî A <sup>GEI</sup>
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FÈĂÚ^¦-{¦{ ^å/\$à^^ Ás@ ÁÔãc Á; -Á>^, ÁÓ¦ãt @{} }Á •ā; \*Á@ ãlÁÙæ{ ]|3; \*Á=9; å/ACE; æf`•ã: ÁÚ|æ; È GÈV@ Á^``ã^å/å/Ae; æf`c^/{ã:cÁ{; |Á\*:æ8:@A] ^&ãa38:Áiãc/Ai: /Å./•^} c^å/8; ÁCE; ]^} å%;/CEÈ: E

#### 5 ddYbX]I '5" : M'&\$% !: M'&\$&' 'A cb]hcf]b[ 'D`Ub'Zcf'GifZUWY'K UhYf : M'&\$% '5 bbi U`FYdcfh Hk ]b'7]h]Yg'5fa m'5a a i b]h]cbg'D`Ubh 5fXYb'<]``gžA]bbYgcHU



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Ô[]]^¦	΀G€	{ * ĐŠ	Û				
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T^¦&`¦^	ΪΙΪ€Œ	{ * £3Š	Û				
Ú@[•]@[¦`•ÁÇV[œepD	HÎÍÈ	{ * ĐŠ	Û				
Ùą̃ç^¦	΀G€	{ * ĐŠ	Û				
Zậ &	΀G€	{ * ĐŠ	Û				
V¦a&@[¦[^c@}}^	ÌG΀Ô	{ * £3Š	Û				
FÊFËÖ&&@{[¦[^c@}}^	ÌG΀Ô	{ * ĐŠ	Û				
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Ôã Ë Ê Ê Ê Ê Ê Ê Â Q[ ¦[ ^ c@ } ^	Ì Ĝ €Ô	{ * ĐŠ	Û				
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Xã),^ ÁÔ@4[¦ãã,^	Ì Ĝ €Ô	{ * <b>EŠ</b>	Û				
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5 Wichna gʻUbX`5 VVYfj]Uhjcbg.

CEÁMÁKCE;} čal, čáj áR }^ TÁMÁT^æ ¦^{ ^} cá∖^ ĭā∧åÁ;} &^Á,^¦Á; [} c@

{ \* EŠÁWÁ, ã| ã ¦æ; • Á, ^ ¦ Áãc^ ¦

5 ddYbX]I `5 '( G]hY`GdYVJZJW@ghg`cZFYei]fYX`5 bUmhYg : M&\$% `5 bbiU`FYdcfh Hk]b`7]h]Yg`5 fam5aaib]h]cbg`D`Ubh 5fXYb`<]``gZA]bbYgchU



<u>Þ[ơK</u>Ô|^æ)č] Ãõ ç^|•Áða Áu\*tŠĎÁ¦[{ Áræ&@ÂU^&[¦å Á; -ÃÖ^&ã ā] Ást-Á @ ] } Ást^Á @ ] } Ás ^[[] Á{ ¦Á • ^Áb; Æ o\*l{ ājā \* Ás@ Á^~ča Å { ^o@ å Ås^c%&ā] } Áā ār ÉÁt‡•[Å][c^ÁsœæÁ@• ^Áā o\*Á^] ¦^• ^} o\*Á@ <u>Á ājā č</u> [āroh; Ásējæ? \* EÁtzÁæ\* ^ lÁs)æ? c Áāroh; æ Ási^Á čāā ^ å Ås`^ & @ Á []āī ! Å] \* Å] ! æ)ā æaāj } ÉásÁ[ Ás ^• ā^ à Ěᡚ ÁOŸ ÁOEF JÊ ÉÉ Éāāj cæ) ^ ÁJ ~ o@ å Á GODÁ æ Ás‡•[ Ás)æ? c Áāroh; æ Ási \* { { ^lÁCUÔÁ æ{ ]]ā] \* Å] ! æjā æaāj } ÉásÁ[ Ás ^• ā^ à Ěᡚ ÁOŸ ÁOEF JÊ ÉÉ Éāāj cæ) ^ ÁJ ~ o@ å Á GODÁ æ Ás‡• [ Ás)æ? c Áāroh; æ Ási \* { { ^lÁCUÔÁ æ{ ]]ā] \* Å] ! ææāj } • Á ã @ Ás@ Á ¢&?] cāj } Å ~ÂUão ÁOEF JÊ ÉÉ Éāāj cæ) ^ ÁJ ~ o@ å Á GODÁ æ Ás‡• [ Ás)æ? i\* a\*A c ^æ{ ^} o\* c ~ { Åsj ~ i ~ } dD ~ i ~ } o\* æ{ ]]ā] \* Ås Á; [ } c@ Á; c@ lÁ@æj ÁT } ^ A ^ !^ Asjæ? i\* a\*A { } ca \* ^ Ás ^ á, [ } āt ! ^ a Åsj ÁUWFÉU WOEÉse) å ÁUWHЮÔ ^] ÁÕ![ č } å; æ? lÉÅJã? ASÁN;ā ÁAÉ æ å/ÖÜÙÁ ¢d æ&cāj } Á, ^ ||• È

#### CI %'f899D'; FCI B8K5H9FŁ<sup>ft/L</sup>

A .....

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V¦&&@[¦[^c@^}^	Í

#### G=H9 '5 ''fG< 5 @@CK '; FCI B8 K 5 H9 FŁ<sup>́f®Ł</sup>

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ECE;cã;[}^ÁarÁ;}|^Á;[}ãð;!^å/åseó/s@)•^Á+Á;^||•K /#€FWF€HEÆEFWJ€GÁse)å/ÆFWJ€IÁ(R;`}^Á;}|^D

#### G+H9 '7 ''fG< 5 @@CK '; FCI B8 K 5 H9 FŁ<sup>'ll Ł</sup>

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Xã}^ ÁÔ@q[¦ãâ^	€ÈG

#### BchYg.

ĢFDØ4[{ÁÚæť^ÁFÌÁţÁ@?ÁUWFÁÜ^&{¦åÁţÁÖ^&ãaţ}}È

QEDØ1[{ Á/æà|^ÁFÁ; Ás@? ÁUWGÁÜ^&[¦åÁ; ÁÖ^&ã;ā]}È

Ô Dئ[{ÁÚæ\*^ÁGÎÁI-Ás@∘ÁUWHÁÜ^&{¦åÁI-ÁÖ^&ãaaa}}È

Q+D⊘4[{Ávæà|^ÁrÁ,ÁQE,^}å{ ^}ơÀFÁ(Áo@AÚWGÁÜ^&[¦åÁ,ÁÖ^&ãrá[}È

ÇD⊘4[{ÁÚæ\*^ÁGËFHÁ;ÁQE;^}å{ ^}ơÂlÁ§tÁœ?ÁUWGÁÜ^&[¦åÁ;ÁÖ^&ãã;}È

#### 6 @8; '%\$&'G<5 @@CK'; FCI B8 K 5 H9 F'f(L

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#### G=H9'?"fG<5@@CK'; FCI B8K5H9FŁ<sup>f®L</sup>

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#### CI&"fB99D'; FCIB8K5H9FŁ<sup>fBL</sup>

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&ã ËFÊBËÖ&&@[ ¦[ ^c@}} ^	Ï€
V^dæ&@{[¦[^o@^}^	Í
V¦&&@[¦[^c@}}^	Í

#### CI' "f899D'; FCI B8K5H9FŁ<sup>ffŁ</sup>

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#### K 9 @@=BJ9BHCFMG5AD@B;

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5 bƯ mhjWƯ A Yh\c Xg.

Ő KAÚÜURÒÔVÙa/Ô00E0Éuő[&"{^} ora00;}" æ¢ÁŰ^¦-[;{æ;&^ÁŰ^][¦ora2ŸFJÁ0EÚÜa00;]^}åä&a≉a00;]^}åä&áv≦400;]

Ú(DX∄) ^ /A&@{{ \air hate [ Aaa} ada : ^ a /aa Air AUY É I Î AT ^ c@ a A G €Ô AEU OT AaaA ^ ||• AEFWEI Ì EAEFWI Ì GEAA a AEFŠÍ Ì GÈ

# **APPENDIX B**

Acb]hcf]b[ <sup>`</sup>K Y``**:**bXYI <sup>`</sup>





# Di fdcgY

- Pæç^Áa^} Á`•^å Áţ Á&[ ||^&oÁ, æc^\ Á`ædaîĉ Á&aæædá, \Á`|[`}å, æc^\ Á\|^çæænå, \A`+&da Ákţ Á, [ \ ÁæeÁc@ Áp^, Ó\ â`@ţ } EDEtå^} ÁP å|•ÂU`]^\~`}å ÁUãz^Áçã, &|`åã; \*Á, \ãçæerÁ, ^||•Áæ), å Á, ~•ãc^Á, [ }ãt[ \ā, \*Å, ^||•Áæ, [ ] ^å Áa^Âc@ OE{ î DUÁ, \
- CE^Á, }^åÁa^Áo@^ÁOE{ ^LÁ; }
- CE^Á[&æe^åÁjãc@jÁs@Asi[`}åælði•ÁjÁJWCÁÇc@Á[¦{ ^¦Á/ÔCEDEJÁj¦[]^¦ċD

V@Á, ^||Á5, å^¢Áš[^•Á, [ơá5, &|` å^Á, ^||•Á5â^} cãa? å/á5, Ás@ÁY ^||ÁQ;ç^}d[¦^ÁM] åæe^ÁQCE[]^} åã¢ÁÒDÁs@æeÁ@æç^Á, [ơá5,^^}Á •æ{]|^å/ás^Ás@ÁCE{^ÁserÁs}^Á, [ā]ơá5, Á@sid[¦^ÈĂ

V@Áāró&[}œadj^åÁgÁ@Á ^||Ág å^¢Ærák^Á[Á[Á, ^æ)•Áœ&[{]āæadj}∱, ÁseļlÁoçæadjæù|^ÁsæædéMu@¦ÁsæædéMu@¦ÁsæædéA ¦^\*ælåāj\*ÁsejÁg åãçãa `ælÁ ^||Ás@ædÁ ærÁ[Ó%sã &[ç^¦^åÁ[¦Ár^æl&@åÁ[`Ó%s`¦āj\*Ás@Á&[`¦•^Á[ÁsœædéA] j]c^}å^åÁg ÁsaÁsaá^ær[}æù|^Á'--[¦ÓAg Á\*æ@lÁ@Ásææd&[}&^!}ā]\*Ás@Å, `le\*ãa]^Ág Ásœædá Á\*æljÅ&çædjælÅ æsåããdj}ælÅsæædfa ÁsaÁsa[}&^!}ä]\*ÁsæAs?iæadjÁ ^||Ébek[æ64sææd&[}&^]; \*As[i\*oÁ][oÁ\*æk@áÅs`i]]\*ÁsæKs?iæadjÁ ^||Ébek[æ64sæædk[]}EÁ

#### 6 UW [ fci bX'

UWCA÷anjåÁUWFEDUWHÁ, ^||•Á@æç,^Áà^^}Á§i,•œe||^åÁ§i,Á[`¦Á@å¦[\*^[|[\*3&Á}}ãorÁà^}^æe@ko@Áár>ÈÁ/@•^Á@å¦[\*^[|[\*3&Á `}ãorÉbeeÁ^-^¦¦^åÁ§IÁs@áÁ^][¦dÉbee^Á&[}&^]čæe|^Á§|`•dæeråÁ[}Á©ä`¦^ÁÖËFÁanjåÁac^&\a&^•&\äa^åÁa^|[、KÁ

- W) ãoÁCHÁ S} [, } Áse Ás@ Á/, āj ÁÔãað Á2[ ¦{ asaāt } ÉÁW) ãoÁCÁ&[ } ã A, ÁÛ ` ase^\} ash ^ åst ^ å Åt | asbāada Ásāt åa å Åt ash Åt | asbāada Ásāt Åtāt à āsbā Ásāt Åtāt à āsbā Ásāt Åtāt à āsbāt à āsbā Åtāt à āsb
- W}ãnÁ ká V@ā Á }ãnÁš[}•ã o Áš[||^&cāç^|^ Á [ Ási^å|[& Ási^å][ & Ási ^å][ & Ási å][ & Asi å][ & Åsi å

5 ddYbX]I '6 ' K Y``=bXYI 'Zcf'BYk '6 f][ \ hcb#5 fXYb'<]``g'Gi dYfZ bX'G]hY': M'&\$% ' : M'&\$% '5 bbi U`FYdcfhi Hk ]b'7 ]h]Yg'5 fa mi5 a a i b]h]cbg'D`Ubhi 5 fXYb'<]``gžA ]bbYgcHJ'



Q\Á\¦å^\Á\$/Á\$@^}cē^Áx@:Á@:å\[\*^[|[\*3&Á}ãA\$jÁ,@3&@Á>a&@4,^||Á\$#Á&[{]|^c\*åÉ&@AN}ā\*àÂUcæe\*•ÁOE{^ÂO}çã[}{ ^}{ ^}cæ}Á Ô^} ơ\ ÁΩ\ÙCEÒÔDÊ4/ ;{ ^;[^ Á\@ Á\}ā¢àÁÙcæe^•ÁCE{ ^ Á/[ ¢ã&Áæ)åÁP;ææåå[ `•ÁT æe^\äæ4•ÁCE^^}& A^XDÙCE/PCET CEDÊÁ å^ç^|[]^åÅæÁræa}åæåã^åÁ®ä^}æäaæaai}}Á^•or{{Á[¦Á,^||●ÁæeÁr@AÞÓE0EPÁĴãrÁCp^^¦|^åÅqiÁæeÁr@AOE{^ÄÖ^●ã}æaai}}Á(¦Á  $\begin{array}{c} \hline U \ddot{U} T & U \dot{A} &$ c@ Á@ å¦[\*^[|[\* 3&Á`} ãÁ§ Á @3&@k@ Á ^||Á§a Á§[{]|^c^åÊæe Á{||[\_• kA Á Á ËÁ W}ãoÁFÁ €FÁ Á ËÁ €HÁ WłãaÁHÁ Á €IÁ ËÁ Á ËÁ ÚRÁ Á V@Ác@ååÁ&@eela&c^\Á^] |^•^} o Ác@Á^|aecã;^Á [•ãtā] } Á Ác@Á\_^||Á&\^^} Á [^``A`Q@Á\_^|A`{A`[^`A`]^} Á@ |^Á\_ ãc@ã Ác@Á`] ^&ãtā`àÁ @| å¦[\*^[|[\* 3&Á } ãd 🖾 🕾 Á{ ||[ \_ • kÁ Á Á WÁ ËÁ ĭ]]^¦Áj[¦cáj}Á Á ТÁ ËÁ { ããå|^Á,[¦cā]} Á Á ŠÁ ËÁ [ \_ ^¦Áj[ ¦cãj } Á Á RÁ ËÁ R[¦åæ); ÁÙæ); å•d[}^Á Á ØÁ ËÁ ~~ll^Á;.^}^dæaāj\*ÁW}ãaÁ+Á Á ÀÁ ËÁ []^} Á@[|^ÁQ[ cæl4[ ¦Á] ælcãæl4kc@38k\}^••DÁ Á V@~Á^{ æi∄ ãi \* Ás@^^ Ás@edæsec^¦• Á^] ¦^•^} oks@ Á ^||Á` { à^¦É&ee Áf ||[ • kÁ Á Á €€FÁc@`Á €€Á WÙ CEÒÔÁ ^ ||•Áse) å Áseå å ãaãi } æ Á ^ ||•Ási • cæ ||^å Ási ^ Á c@ ¦•Áseå bæ &^} o Ási Áse) Á ^ ¢ã cã;\*Á ^||Á ãc@ko@^Á∈€FË;€€Ás;^•ã\*} æeãi}ÈÄ Á Í€FÁs@`Á €€Á ÞÓÐÐ₽ÁĴã¢Á^∥•ĔÁ Á ΀FÁs@`€€Á UWGÁOE∥ãee) OÁ/^&@^• c^{ • Á ^∥• ĚÁ Ì€FÁc@<sup>°</sup> ÁJJJÁ Á UWFEDJWHÁOE∥ãee) cÁ/^&@@^•c^{•Á, ^∥•ÈĂ Á UWFEUWHĄ ^||•/45,• cæ||^ å/4a^ / j, æ cæ • / j, c@ ¦ / koæ) Á/UUEDÔÉko@ ÁCE{ ^ Ék ¦ ÁCE| ãæ) cÁ/^&@ ^ • c^{ • / kæ^ / ka^ • & } æc^ å/ka^ / ko@ å Á Tą]}^•[cæÁ] ã ˘^Á,˘{ à^\bĂ/æà|^ÁOĖ=ÁਙÁ[lċヘåÁà^Á}ã ˘^Á,˘{ à^\bĂa`ó4ş&|ĭǎ^•Ás@ÁÖÜÖTOÙÁ,˘{ à^lÁæ}åÁæ}^Á[c@≀A }æ¢^ÇDÁc@^Á^||•Á;æ°Á@eee^ĚÁ/@:Á^||Á°]^Á§;Ác@áÁzæà|^Á§a;Ásæàà!^çãeee^åÁsee Á{||[\_\_•KÁ Á W}\}[,}A Á WÞÁ ËÁ Á TWÞQÁ ËÁ Tĭ}ã&ãla∉Á Á ËÁ TUÞÁ T[}ãd[¦ã}\*Á ÖUTÁ ËÁ Ö[{ ^∙ca&Á Á ΢ÖÁ ËÁ Qåĭ∙dãædÁ Á ËÁ ÚÉJÉÀ Ú\*à|a&AÚ\*]]|^Á Á Á Á ÔUTÁ ËÁ Ô[{ { ^¦&ãæ¢Á ËÁ ŴÜÁ Qlataeeaai}À ŒÓŒÞÖÁ ËÁ Œaæ)å[}^åÁ ÚOÒZÈÁ ËÁ Úāh:[{ ^c^¦Á Á ÜÒTÁ ËÁ Ü^{ ^åãæd⊧Á Á Q Á^&^} œÁ^æ+e É & e Á ¦[]^\c` Á !æ) • ^\A Á@ Á^{ æijā \* Áæ) å Á@æx≸a Á œil Áãa^} œæA di A @æxÅa Á œil Áãa^ à Áæ Á /ÔOEEE/Á@æe Á ¦[\* ¦^••^à Á@æ} å Áæ Á }[、Á,^ædā]\*Á&[{]|^cā[}DEĂāxÁa^&æe[^Áæd]]æb^}cÁc@æeÁæd)Á]åæe^åÁ,^||Á5jå^¢Á,ãc@Á,[|^Á5j+[{æeā]}Á&[}&^\}ā!\*Á\*æ&@Á , ^||Á [č]åÁà^Áţ-Áą ][¦cza)&^Ág Á;ze •Á;}Ág Áč č¦^Áza)åÁ;} }^\+ ÈÁQ Ázaååãaą]}Ê&ze Át¦[č}å, ze ^lÁ ča‡aĉ Á&[}c3)č ^ •Ág Á áj]¦[ç^Áza)åÁ&[}cze(3)za)oÁ,|č{ ^ •Á&[}c3)č ^ Ág Áç Á;g3, Áz Áza4/sa)åÁQ ¦ã[}cze/Á¢c ^ dÊsce Ásjå^¢ Á alÁč }&ca] Áze Áza4

a;ji[çmayana]}ua;jua;ja;u;j;[{mmayana]}ua;jma;numanayayana;ana;ia[}ua;my;uuaaana;ana;ia[}ua;my;ana;u;my;ana;im &@&\A{[A{; ab^A``\^Ax@aa/sae|AOE{ ^A{, }}^åA, ^||•Aso/A(^ae/åAso)åAx@aa/sae|A{;aso/•A{;Ax@A; ^||•Aso/A/{ [ç^åA{[{ Ax@Aso/aazXXX A

#### 5 ddYbX]I '6' K Y``=bXYI '2cf'BYk '6f][ \ hcb#5fXYb'<]``g'Gi dYf2l bX'G]hY': M'&\$% ' : M'&\$% '5 bbi U`FYdcfh Hk ]b'7]h]Yg'5fa m5a a i b]h]cbg'D`Ubh 5fXYb'<]``gžA]bbYgchU'



V@ÁØŸÁŒEJÁŒEJ^ÆEJA\*#J^}åã¢ÁÓÁ/æaà|^ÁÓEFÁ®Q\_ ●Ás@A{ [●cA&`¦¦^}c4j`^A{[A\$jå^¢EĂA/@A}^||Á\$jå^¢A&[}c4j`^●Á&[}c4j`^●Á&[}c4j`^A{[A\$jÅ ]¦[\*¦^•●EĂŒaåãaā]}a4jÁ^&[¦å●Á^\*ælå3j\*Á\$jåãçãaĭælĄ^||●Á&[}c3j`^Áx[Áà^&[{ ^Áæçæa‡æaà|^ÁæeÁ,^, Á, ^||●Áæ⁄Áå¦ã||^åÁæ)åÁ [|å^¦Á}}}^^å^åAåÁ, ^||●Áæb^Ár^æp^åÁæ)åÁ^{ [ç^åEĂÁÁ Á

<u>Øā</u>č¦^•ÁÓËCÁ+ajåÁÓËHÁQŢ,Ás@Á[&ææā]}Áj,-Á,^||•Ábā^}cãā?åÁ5jÁ/æà|^ÁÓË=ÈÁYã@ÁsA}[]}Á,^A||Á;æ{^Êbs@Á[&ææā]}Áj,-Ás@æeÁ ^^||ÁsæjÁs^Ábā^}cãā?åÁ`•ā]\*Ás@ÁköàãdÉØEjå+Á;¦ÁköàãdÊÚ/>æ&&@Áč}&cā]}ÁsejåÁs@}ÁSî]āj\*Á5jÁs@Ás^•ā^åÁ,^||Á;æ{^ÊÁ @&&@Á,ā]|Á@ā@Ás@āA,^||Á;æ{^Áj}Ás@Áãčč¦^ĚÁ Á

V@ÁCE;]^}åã¢ÁÓÁOEccce&@(^}cA&[}ccea)•Áececceajaceà|^Ási[&č{ ^}ccean]}}Áv[¦Á\*cce&@á,^||É56984|čaå]\*Ási[¦ā]\*Áv[\*•ÁQEA/sececeajaceà|^DÓEÁ V@Áeccce&@(^}c4siÁ\*[[c\*åAsi^ÁTāj}^•[ccea^X]ã`^Aj`{ à^¦ĚÁV[Áşā\*, Ás@Ási-[¦{ cean]}ÁSv[}&v\}ðj\*Áse4, ^||É584&&Aj}Ás@Á å^•ã^åÁ, ^||Á,`{ à^¦Ási, Ás@Ási[[\{ ce\•ĚÁÁ

: **M1&\$% 'I dXUhy**' Á

, ∑ Þ[Á,^,Á,^∥•Á,^¦^Áæåå^åÁ[Á@?Aåæææàæ^ÀĂ Á <mark>Cb[c]b[`9Z2cfhg`hc`IdXUhY`5ddYbX]I`6`</mark> Á

- •Á V@Á ^||/Ág å^¢ÉV/æà|^ÁÓË ÉÝ@æe Ás^^} Á&[{] æd^åÁ ão@á@Á ^||•Ásā^} cãætåÅfa ÁE[]^} åã¢ÁÖÉÅ @&&@&E[} cæag] Á
  @ãr q[ | 38ædÁ, æe^\!Á \* ædáč Áse) åÁt ![ \* } å, æe^\!Át|^çæag] } ÅsæædÉÅDEÅ, \*{ à^\!Át -Á, ^||•Å, ^\!^Åsa, ^\:Asa,
- •Á V@Á^][•ãt[¦^ÁsecÁs@Á/ÔOEDEÚÁ;~a8x^Á;āļļÁ&[}cāj`^Át[Ásh^Á;dajā^åÁt[Á;àcæan],Ásesåãaāt]}æ4Á;^||Ásj-{¦{æaat]}ÊÉ;@¦^Á ][••āaļ^ĚÁ

#### 5 ddYbX]I `6 `HUV`Y`6 !%UbX`5 HUWY a Ybhi 5 jU]`UV`Y`K Y``=bZcfa UH]cb`GcfhYX`VmA]bbYgcHU'I b]eiY`K Y``BiaVYf` : M&\$% `5 bbiU`FYdcfhi Hk]b'7]h]Yg`5 fam5aaib]h]cbg`D`Ubhi 5 fXYb`<]``gžA]bbYgcHU



OŢ]]^}åã¢ÁÓÁ/æà|^ÁÓ⊞Á&[}œæ]•ÁæÁ\*`{{æ¦Ábj-{¦{æea]}}Áæçæa‡æà|^Á&[}&^\;}j\*Á∞é&^\;œæjÁ,^||Éæo}åÆáA{[¦c∿åÆà`Á Tā]}^•[œæÁ`}ã`^Á,^||Á,`{à^\ÈÁ Á

,` V[Á∧æ&@Á[¦Áŝ∧œa‡∧åÁ∧&[¦å•Á∧\*æ¦å]\*ÁæÁ,^||É4,]^}Á@Áæ]]¦[]¦ãææ∿Áā¦^Ás∧|[, Áæ)åÁ<^|%&ók@/Ás[[\{æ\Á &[¦¦^•][}åā]\*Á[Á@ÁT]]}•[œať}ã`^Á,^||Á,`{à^!Á[Á@Á@Á,^||Ás^3]\*Á^æ&@åÈÁQÁ@Á@Á`}ã`^Á,`{à^!ÁsA`}\}[,}Á -{¦ÁæÁ,^||É5avÁarÁ5J&|`å^åAsə}åA{[¦c∿åA5JA&@ÁQE]]^}åã¢ÁÓÁOcccæ&@(^}o%a^Á©ÜÖT©ÙÁ,æ{^Á[¦ÁUVPÒÜÈÁÜ^&[¦å•A5J&]`å^åÁ5JÁ c@ÁCEJ]^}åã¢ÁÓÁOcccæ&@(^}o%aœaÁ(æáÁ;¦Á(æÁ,[o%a^Asæçæa‡aæa)^Á{¦Áræ&@Á,^||Á5J&]`å^hÁ

- Á
- •Á V@^ÁÔ[č}c´ÁY^||ÁQ;å^¢Á;^||Á[\*ÊÁ
- Á OB& & • Ázť ¦ ^ { ^ } og DÉÁ
- •Á Ô[¦¦^•][}å^}&^Á^|æe^åÁq[Á@?Á ^||ÊÁ
- •Á Øā^|åÁ,[ơ^•Áa) åÁa[¦ã,\*Á[\*•ÊÁ
- •Á Y ^ ||Á&[ } d` & cāj } Á& ãæť ¦ æ į ÉÁ
- Á Ö [& { ^} cæcā]; } Á [ Á ^ || Á [ åãa&æcā]; } É & ) å Á
- •Á Ù^æþðj \* Á^&[¦å•ÈĂ

# 5 ddYbX]l '6 '5 HUW a Ybh

- FĚÁ Y^∥•Áp°{à^¦^åÁ∓€IÏÏGÁs@{[`\*@4FJIÏÏGÁ
- GÈĂ Y^∥•Áp\*{à^¦^åÁGEEEÏ€Ás@[\*\*@ÁGGÍJ€ÎÁ
- HĚÁ Y^∥•Á₽`{à^¦^åÁGHFÏIFÁs@2[`\*@ÁGHÍÏÍHÁ
- IÈĂ Y^∥•Á⊃`{à^¦^åÁGH΀ÎÎÁs@[`\*@ÁGÍÏIIHÁ
- ÍÈĂ Y^∥•Áp`{à^¦^åÁGÌÍÏHÍÁs@[`\*@ÁÌÌGÏ€JÁ
- ÎÊÁ Y^∥•Áp`{à^¦^åÁ퀀GIÌÁs@[`\*@ÁÖÜÖTOÙÁsa)åÁUVPÒÜÁ

Á







5%\*%





# **APPENDIX C**

8 UHJ 7 c``YWIjc bž A UbU[ Ya Ybhž UbX Df YgYbHJHjcb


5 ddYbX]I '7 % 8 UHJ7 c``YWIjcbžA UbU[ Ya YbhUbX'DfYgYbHUhjcb': ]gWU'MYUF'&\$% ' : M&\$% '5 bbi U'FYdcfh Hk ]b'7 ]hjYg'5 fa mi5 a a i b]hjcbg'D`Ubh 5 fXYb'< j``gžA ]bbYgcHJ



# %\$ -BHFC817H=CB

5 ddYbX]I '7 % 8 UHJ7 c``YWIjcbžA UbU[ Ya YbhUbX'DfYgYbHUhjcb': ]gWU'MYUf'&\$% ' : M&\$% '5 bbi U'FYdcfh Hk ]b'7 ]hjYg'5 fa mi5 a a i b]hjcbg'D`Ubh 5 fXYb'< j``gžA ]bbYgcHJ



## &"\$`; FCI B8K5H9F`@J9@G'5B8`; FCI B8K5H9F'EI 5@HM

## &'% 8 UHJ'7 c``YWIjcb'UbX'A UbU[ Ya Ybhi

 $\tilde{O}[[`] a, aev: Av, c/Av, add av: Av, add av: Av, add av: Av, add av: Av, add av: Av, Av, av: Av, av: Av, c/Av, add av: Av$ 

 $Y = e^{\frac{1}{4}} (\sqrt{1} - \sqrt{1}) (\sqrt{1} - \sqrt{1}$ 

5 ddYbX]I '7 '% 8 UHJ7 c``YWIjcbžA UbU[ Ya YbhUbX'DfYgYbHUhjcb': ]gWU'MYUf'&\$% ' : M&\$% '5 bbi U'FYdcfh Hk ]b'7 ]hjYg'5 fa m5 a a i b]hjcbg'D`Ubh 5 fXYb'<]`gžA]bbYgcHJ



Ω[¦Á,æe^¦Á^ç^|Á,^æe`¦^{ ^} o=É&@\_Á&^]c@Át[Á, æe^¦Á-![{ Áx@\_Á`¦ç^^^åÁt[]Á; Áx@A`¦¢æ]å \* Á^|^çæænā}} Á æ Á { ^æ>`¦^åÈĂÖ-![`}å, æe^¦Á+|^çæænā} •Á,^¦^Á&æ4&`|æe^åÁs^Á`àdæ&ca3; \*Áx@-Á&^]c@=Át[Á, æe^¦Á+![{ Áx@\_Á`¦ç^^^åÁt[]Á; ^ ^||Á&æenā] \* Á+|^çæænā] • Áxe}åÁxeh^Ásj&{`å^åÁsjÁx@~Á@ard[¦&&æ4Å;æe^¦Á+|^çæænā] Ásåææææ>Á**4ÇE]**]^}åã¢ÄÖÈ=DDĂ

## &"& ; fci bXk UhYf'9`Yj Uhjcb'7 cbhci f'A Udg'

V@ Á, [• óÁ ¢ c^}•āç^Á, æe^¦Á^ç^|Á, [}ãt[¦ā]\*Á?ç^} óA,^¦-{|{ ^ a/&i`}a]\*ÁØŸÁGEFJÁ, æe ÁB, ÁR`}^ÁQÛ`æ!c^¦ÁFIHDÈ V@ a &aææA , æ Á •^åÁt[Á,!^] æ!^Á\*![`}å, æe^!Á/|^çææti}}Å&[} (t``lÁ(æ) •Át[Å&^^] Á\*![`}å, æe^!ÁæeÁUWFEDUWHÁæ)åAUWGÁQUWHÁæ Á •@, }Á;}Á@ Á æt ^Áti`!^Áæe ÁUWFÁB, Á@ ÁUWFÁ ^&cti]}(t. DÉ æbe)åÁt[¦Á @et|[, Á\*![`}å, æe^!ÁæeÁUæ?•ÁOEÉOÉESÁ æ) åÁÓ` ā¦åāj\*ÁF€GÉZŐ![`}å, æe^!Á/|^çææti}}Á&[}(t``lÁ(æ) •Áed^ÁB,&]`å^åÅ, ãr@3)Á@ ÁB, åãçãa` ætÁ^&cti] •Á; Ár@étÁ^][!dÉ V@!^ÆrÁ;A;[oÁæÆ&[{]!^@}•ãç^Á, æe^!Á/\ç^|Á?ç^}oÁt[!Á @et+[], Á\*![`}å, æe^!ÁæeÁUãe^ÁdÉ\*ãç^}Á©Á, ^||Á^ætaj\*Ár@ætÁ@e Á à^^}Áb]]^ÉĂ

## &" ; fci bXk UhYf Ei U]lmi7 cbhci f A UdgʻUbX 7 fcgg!GYW]cbgʻ

 $\begin{aligned} & \left[ \left\{ \frac{1}{4} \right\}_{i}^{k} \left[ \left[ \frac{1}{4} \right]_{i}^{k} \left[ \frac{1}{4$ 

Ô[} ææ{ ā} æ} ó&{} } & A } dææā{} • Á{{ : | Á T ãå å | ^ ÁV} ãoÁ+K} ^ || • Áæ} åÅ{ ^ || • Áæ} åÅ{ ^ || • Áææ×Á\* || ^ Á, ^ } ^ dææ×ÁV} ãoÁ+K} ãoÁ+K} @\_ ` Å :^ &[ ç^:^ Á, ^ || • Ás@æoÁ\* || ^ Á, ^ } ^ dææ\*ÁV} ãoÁ+Kæj å Ás@æœkæ</ Åå^ā, \* Á\*æ{ ] | ^ å Áæe ÁæÆ{ [ ] äť ! ā] \* Á, ^ || DÁæ±^ Á @\_ ` } Å ] æb^} o@ • ^ • Á{} Ås@ ÁŠ[ ` ^ : ÁV} ãoÁ+Kæ [ &[ } &^ } dææā{} Åf, æð • ÉÉa č oÁ, ^ : ^ Å, [ oÁ • ^ å Á{{ : | Å&[ } d[ ` ! ā] \* Á, ` |] [ • ^ • Á\*¢&^] oÁ, @} Á ] Æ^] o@ • ^ • Á{} Ås@ ÁŠ[ ` ^ : ÁV} ãoÁ+Kæ [ &[ } &^ } å Ás@eæAæd Åå å æ ÉÉa č oÁ, ^ : ^ Å, [ oÁ • ^ å Á{{ : | Å&[ } d[ ` ! ā] \* Á, ` !] [ • ^ • Á\*¢&^] oÁ, @} Á ] [ ÁŠ[ ` ^ : ÁV} ãoÁ+KÁ, ~ || • Áse ^ Á[ &ææ^ å/Á] Ás@ Áç ã&ā} ãC ÉÉA

20[\£Uār^ÁDEA @eqh[] ِڴ\[`}å, ær\ĒŠeo)Áne [&[}&^}d æda]}Á, að Áne Á, \[çãa^åÁ[\Á&ā Ё=ÉEËå ﷺ @[\[^o@}^ÊA ð] &^Áœá Áne Áne Á &@{ ﷺ جُلالًا } & \] فَ شَافَهُ اللَّهُ اللَّهُ اللَّهُ اللَّهُ اللَّهُ الْمُعَامُ اللَّهُ الْمُعَامُ اللَّهُ أُ 5 ddYbX]I '7 '% 8 UHJ7 c``YWIjcbžA UbU[ Ya YbhUbX'DfYgYbHUhjcb': ]gWU'MYUf'&\$% ' : M&\$% '5 bbi U'FYdcfh Hk ]b'7 ]hjYg'5 fa mi5 a a i b]hjcbg'D`Ubh 5 fXYb'< ]``gžA ]bbYgcHJ



æ^æ&e)å&&[}œa(ā)æ)d&^\*¦æåæaā(})ÈÓ\[••Ë^&aā(}•Á,^¦^Áe+[Á,¦^]æ^åÁ(H,A)āc^ÁOEA(A) \* dæc^Áo@Aç^¦a&e4&aă`aā(}A [-Á&ā ËFÊEËå&@[[[^c@}}^ÉA/@/Áa[&[{}{\*\*E^&a}(A)]A(æa])A(æa])A(æa])A(æa])A(æa])A(æa])A(æa]A(A)]A(A)]æ^åA(A)]^A(A) &[}œa(ā)æc^àAeč`ã^\ÈÁ

2[ الْمَاعَدَ ٨َڷَ ٨ُ (هَطَالَ أَجُلَانَ ) مُعَدَّمَا الْحَقَابُ الْحَقَابُ الْحَقَابُ الْحَقَقَ الْحَقَقُ الْحَقُولُ الْحَقَقُ الْحَقَقُ الْحَقَقُ الْحَقَقُ الْحَقَقُ الْحَقَقُ الْحَقَقُ الْحَقَقُ الْحَقَقُ الْحَقُقُ الْحَقَقُ الْحَقَقُ الْحَقَقُ الْحَقَقُ الْحَقَقُ الْحَقَقُ الْحَقُولُ اللَّهُ اللَّحَقُ الْحَقُولُ الْحَقَقُ الْحَقُولُ الْحَقَقُ الْحَقُلُ الْحَقُولُ الْحَقَقُ الْحَقَقُ الْحَقُلُولَ الْحَكَمَ الْحَقَقُ الْحَقُلُ اللَّعَمَاعُ الْحَقَا الْحَقُولُ الْحَقَقُ الْحَقَلُ الْحَقَقُ الْحَقُولُ الْحَقَقُ الْحَقَالُ اللَّعَالَ الْحَقَالَ الْحَقَالَ الْحَقُولُ الْحَقَقُولُ الْحَقَقُ الْحَقُلُ الْحَقَقُ الْحَقَقُ الْحَقُلُ الْحَقُلُ الْحَقُلُ الْحَقُلُ الْحَقُلُ الْحَقَالُ الْحَقَالَ الْحَقُلُ الْ وَقَعَالَمُعَامِ اللَّعَامِ اللَّحَالِ اللَّقُولُ الْحَقَا الْحَقَا الْحَقَا الْحَقَا الْحَقَا الْحَقَا الْحَقَلُ الْحَقَالُ الْحَقَا الْحَقَلُ الْحَقَالَ الْحَقَا الْحَقَلُ الْحَقَلُ الْحَقَا الْحَقُلُ الْحَقُلُ الْحَقَا الْحَالَ الْحَالَ الْحَقُلُقُعُولُ الْحَقَالَ الْحَالَ الْحَقَا الْحَقَا الْحَقَا الْحَقَالُ الْحَقَا الْحَقَالُ الْحَقَاقُ الْحَقَا الْحَقَالَ الْحَقَالُ الْحَقَا الْحَقَا الْحَقَا الْحَقَا الْحَقُ الْحَقَا الْحَقَا الْحَقَا الْحَقَا الْحَقُ الْحَقَا الْحَقَالُ الْ وَقَعَا عَلَيْ الْحَالَقُولُ الْحَقَا الْحَقَا الْحَقَا الْحَقَا الَحَقَا الْحَقَا الْحَالَ الْحَالَ الْحَقَا ال الْحَالَ الْحَالَ الْحَالَ الْحَالُ الْحَالُ الْحَالُ الْحَالَ الْحَالَ الْحَالَ الَحَالَ الْحَالُ الْحَقَا الْ وَعَالَكُوال

20[¦ÂÙãơÁSÁ@eqh|[ֻÁ'¦[`}å, æơ\É&eq)Áns [&[}&^}dæqā]}Án; ang Áns Án; ¦çãna ^åÁ[¦Ánda&Q[¦[^c@}}^ÉA;ā, &^Áo@a Áns Áo@Aj¦ā[æôÁ &@{ 38æqÁn, Á&{}&^;}á;}Án;Ánzé&[}&^}dæqā]}Án;æa ã ÉÁ/@Áns [&[}&^}dæqā]}Án; ang Áng ¦ÁnjàðrÁSÁ, ane Án;'] ad ^åAn;}|^Áng i Áng •āð & Ánd@ i Áng i Áng i Áng •āð & Ánd@ i Áng i

Q[ | ÁÓ`ā¦åā] \* ÁF€GÁ @ed|[ \_ Á\* |[ ` } å \_ æe^ \ÉÉeek&[ } &^ } dæeāj } Á; æj Áār Áj \ [ çãā^å Á; [ çãā^å Á; [ Áçā] ^ | Á&@[ | ãa^ÉA āj &^ Áx@á Áár Áx@ Á&@ { 38ædÁ [ ~ Á&] } Å; æj Áār Á; [ , cãa^å Å; [ Áçā] ^ | Áx@[ | ãa^ÉA āj &^ Áx@á Áár Áx@ Á&@ { 38ædÁ [ ~ Á&] } Å; æð Åæ ÉFÉEË å 38.@[ \ [ ^ c@ } ^ ÉA [ Áb]` • dæe^ Áx@ Á [ ` \ &^ Áxe^ æbed å åd & [ } cæ { āj æj óÅa^\* \ æå æeāj } ÉÓE&k [ •• Ë ^ & cāj } Å; æ Áxep [ Á] \ / ] æ/ å Á[ \ A å 38.@[ \ [ ^ c@ } ^ ÉA [ Áb]` • dæe^ Áx@ Á [ ` \ &^ Áxe^ æbed à åbe / æbed a æd i } Å; æð æbed a æd i } Å å 38.@[ \ [ ^ c@ } ^ ÉA [ Áb]` • dæe^ Áx@ Á [ ` \ &^ Áxed ^ æbed a æd i } å å að að a ÁF€GÁt[ Áb]` • dæe^ Áx@ Á; \ c38æd áb a čaj } Á; Áçāj ^ | Á&@[ \ ãa^ ÉA @ Ábe [ & ] } &^ } dæaj } Å; æj • Á[ \ ÁÓ` åå āj \* ÁF€GÁ; ^ \ ^ Å Ó` åå āj \* ÁF€GÁt[ Áb]` • dæe^ Áx@ Áç^ \ c38æd áb a čaj } Á; Áçāj ^ | Á&@[ \ ãa^ ÉA @ Ábe č ão^ \ ÉA

Ô[}œæ[ā]æ]of&[}&^}dææā[}•Á[¦Á^&[ç^¦^Á\_^||•Ás@æs%e\*^Áse&aãç^|^Á,`{]ā]\*Áse\*^Á;@[,}A5jAjæ\*}c@•^•A,`jAc@A ã[[&[}&^}dææā]}A[æ]•Ě</@•^Açæ\*\*^•Á,^!^A&[}eã^\\*åÉs\*\*o4,^!^A\*^}eal^A,`]a#^Ase#^A;@,`}A5jAjæ\*^}c@•^•A,`jAse^A ã[&[}&^}dææā]}A\$[]d[``!•ĚÔ[}&^}dææā]}•Á[-Á^&{[ç^!^Â, ~||•Á\*^}r`eal^A^]!^^\*}o4se#^Ase[}A6[];a# Ase^Ase#^A[]A5] æ#A\*![``}å, æz^!A5A^]\*A\$!æ;}A{Ex@A},~||LÁ@}&^Êsc@A8[}&^}dææā]}•A\$[A,[o4se\*\*\*A\*]\*A\*]\*A\*]\*A\*]\*A\*]\*A\*]\*A\*]\*A\*]\*A\*] [!Á\$\*]c@ĚÔ[}ææ[ā]æ}of&[}&\*}dææā]}•Á{[!Á^&[ç^!^Â, ~||•Á\*@æs%e\*^A;[ofse&aã;^]^A,`{]]ā]\*Ase\*A\*[]^A;~{]]a}\*Ase\*A\*[]A\*][-\*•A [.Á8]]c@ĚÔ[}ææ[ā]æ}of&[]&\*}dæaā]}•Á{[!Á^&[ç^!^Â, ~||•Ás@æs%e\*A;A\*][ofse&aã;^]^A,`{]]ā]\*Ase\*A\*[]^A;~{]]a}\*Ase\*A\*[]A\*][-\*•A



#### 5```G\U``ck 'UbX'8 YYd'; fci bXk UhYf'JC7 'G]hYg'

OEÁse|ÁÇUWFÁse) å ÁUWGÁÓĭā¦åā) \* ÁF€CĐÁ, ^||Á[&æaā]} • Á, @^¦^Áç[|æaā]^Á; |\* æ) &‰K[{][ĭ}åÁÇXUÔDÁ æ{]|^• Á June 2019:  $\wedge |\dot{A}| = \hat{A} \otimes \hat{$  $s_{\rm I} \approx s_{\rm A} = s_{\rm$ OE "` | a) & ÁÚ | [ b & ÁÚ | a) ÁÚ OE Ú Ú DÁOB a^ } a' { ÁF ÁY ^} & ÉT a: ÁG ÉGEFÍ DÉÁÁ

#### CI %"8 YYd': fci bXk UhYf"

Ùæ; ] |^ÁXU Ô• Áæ; åÆÊ Ëåã ¢æ; ^ĚÜ^•^œ/@ 妿; |^^ç^•Á; ¦ÁŒŒ€Áæ; ] |ã; \*È June 2019:

### CI & "G]hY'5 'G\ U`ck '; fci bXk UhYf'

June 2019:

- €FWF€ÌKÁ CE; Á; à•dč &cā; } Á; ¦^ç^} c^åÁ;@Á; æ; ] |ā; \*Á; { ] Á;[ { Áà^ā; \*Áå^] |[ ^^å/ā; Ás@Á; ^||LÁ;@; |^+ |^Éá;@Á; ^||Á &[`|åÁ[0Áà^Áæ{]|^åÈÁ
- €FWHÍ€KÁ Ùæ{ ] |^åÁæ Áæ} Áæ¢^¦}æãã^Aấ Á ^||ÆFWF€Ì ĚÁ

#### CI & 'GIHY'7 'G\ U`ck '; fci bXk UHYf'

All Wells: Ùæ{]|^Á^æå

#### CI & G]hY'7 'Gi fZUWY'K UhYf'

Ùæ{]|^Á∖^æåÁæeÁ`¦-æ&^Á æe^¦Á[ã,o-ÈÁ All Wells:

#### CI & 6 i ]`X]b[ '%\$&'G\ U`ck '; fci bXk UhYf'

All Wells: Ùæ{]|^ÁXUÔ•Áæ}åÁ∓ÊËËåã[¢æ}^Á

### CI & "G]hY'? 'G\ U`ck '; fci bXk UhYf'

June 2019:

€FW΀ÌKÁ ∖	V@^Á,^  Á, æ•Á5j,c^}å^åÁq[Áa^Á^āj•œaþ ^åÁ5jÁG€FÏÊáa`ơÁ^āj•œaþ ææāj]}Á, æ•Áj`•@;åÁaæ&uÁa`^Áq[Áa^ æ•Á
ä	æ•[&ãæe^å,Áãc@Á^å^ç^ []{^}@~Á,~Ác@AÛãe^LA&@;!^-{;'^Ê&c@^Á,^  Á&[` å,Á,[c/áa^Á;ae{] ^åÉA
€FW΀JKÁ ∖	V@^Á,^  Á, æ•Á5j,c^}å^åÁq[Áå^Á^∄•œa ^åÁ5j,ÁG€FÏÊ£à`óÁ^∄•œa æaā[}Á, æ•Á`•@^åÁaæ&k,Áa`^Áq[Áå^ æê•Á
ć	æ•[&ãæe^åÁ,ãc@Á^å^ç^ []{^}o•Á,Ác@AÛãe^LAs@¦^-{¦^Êas@Á,^  Ás[č åÁ,[oÁs^Á;æ;] ^åÈÁ
€FWÎ FFKÁ `	V@^Á,^  Á, æ•Á5j,c^}å^åÁq[Áà^Á^∄,•œe ^åÁ5j,ÁG€FÏÊáà`ơÁ^∄,•œe æeãt]}Á, æ•Á,`•@^åÁaæ&k,Áa`^Áq[Áå^ æê•Á
ć	æ•[&ææ*å,Áác@á^å^ç^ []{^}@.Á,~kô@.ÁÚæ*L4ko@;!^-{;'^Êko@,Á,^  Ak(`jå,Á,[o+áa^Á;æ;] ^åÉA
€FWÎÎÏKÁ `	V@^Á,^  Á, æ•Á5j,c^}å^åÁq[Áà^Á^∄,•œe ^åÁ5j,ÁG€FÏÊáà`ơÁ^∄,•œe æeãt]}Á, æ•Á,`•@^åÁaæ&k,Áa`^Áq[Áå^ æê•Á
á	æ•[&ææ*å, ãc@á^å^ç^ [] { ^} o á ko@ ÁUã*Lás@ ¦^-{ ¦^Ês@ Á ^  Ás[ *  å, f [ofa^á a; ]  ^åÉá

# 5 DD9 B8 <del>+</del>.'8 <sup>..</sup>

Comprehensive Groundwater Quality and Groundwater Level Database



D.1 Comprehensive Groundwater Quality and Groundwater Level Databases 5 ddYbX]I '8 % 7 ca dfY\ Ybg]j Y'; fci bXk UhYf'Ei U']miUbX'; fci bXk UhYf'@/j Y'' 8 ULU/UgYg': M&\$%9 : M&\$%9 5 bbi U'FYdcfhi Hk ]b'7 ]h]Yg'5 fa mi5 a a i b]h]cbg'D`Ubhi 5 fXYb'<]``gz̈A ]bbYgcHJ



 $V @ \dot{A} @ \dot{a} (1 a B a a d \dot{A} + [\dot{a} a a a \dot{A} a a a a \dot{A} a a a \dot{A}$ 

AMMMADEMA Á	<u>Ô[}ơ\}ơ</u> Á
Ô[{]^ ^ç´ØŸF9Á	Õ¦[`}å,æe^¦Á∾ ^çæaāį}●Á
Ô[ { ] [ ¦ , ˘´ØŸF9Á	Õ¦[`}å,æe^¦Á`æþãĉkÁ(¦*æ)æ3kÁåææeÁ
Ô[{]]]], ´´ØŸF9Á‱	$\tilde{O}^{\dagger}[~~] a_{,} = ae^{+} \dot{A}^{,} = a ac^$
Ùã∿ÁÔÁ, ˘´ØŸF9Á	Õ¦[`}å, æe^\¦Á`æ‡ãĉkÁ\$j[¦*æ}ã&ÁåæææÁÇÙãe^ÁÔÁ;} ^DÁ

D.2 Operable Unit 1 Statistical Analysis



## ; fci d<sup>\*</sup>%Ë<sup>\*</sup>8ck b[ fUX]YbhcZH; FG<sup>\*</sup>

€HWÌ€ÎÁ	€WÌ€ÎÁ	€HŠÌ€GÁ	€HWÌ€FÁ
€HTÌ€ÎÁ	ÚRÀÌ €Î Á	€IWÌ€GÁ	€HWÏ FFÁ
€HŠÌ €Î Á	€HTÌ€GÁ	ÚRÀÌ€ŒEÁ	€I WÏ FFÁ

## ; fcid'&'Ë'5fYU'9IhYbhcZD`iaY'

€HWÌ€ÍÁ	I€JÍÍÏÁ	€IWÌIFÁ	€IWÌÏÍÁ
<b>€HMÎÏGÁ</b> anàaa) å[}^åÁ	€IŴÏHÁ	€IWÌIHÁ	€IWÌÏÁ
€HŠÌIÌÁ	€IWÌHGÁ	€IWÌHHÁ	G€ÎÎÌÌ [ĭd∱,-Á∧¦çã&^
€HŠÎÏHÁ	I€IWÌ I Í Á	€IWÌIÎÁ	€IWÌIJÁ
€HŠÌ HHÁ	€WÌIÁ	€IWÌÎF æàæ)å[}^å	€I Ŵ ŒÁ
€HŠÌÍJÁ	€WÌJÁ	I€JÍIJÁ	FJFJIG æàæ)å[}^å

## ; fci d" 'łł'Ë'8 ck b[ fUX]YbhGYbhjbY'

£I WÌ Ï FÁ	∉IWÌÏÍÁ	EI WÌ Í FÁ	

# ; fcid'('Ë'@UhYfU'GYbhjbY''

€HWÌHFÁ æàæ)å[}^åÁ	€HŠÌIÎÁ	I€JÍÍÌÁ	I€JÍIÌÁ
€HWÌ FFÁ	€HŠÌHGÁ	€IWÌÍÍÁ	€IWÌHJÁ
€HWÌ€IÁ	€HŠÌÎFÁ æàæ),å[}^å	€WÌÏJÁ	€WÌHÌÁ
€HMÎÏHÁ	€HŠÌÍIÁ	€IWÌ΀Á	€IWÌIÌÁ
€HMÎÏGÁ anàan)a[}^å	€HŠÌIFÁ	I€JÍIÏÁ	€IRÌHJÁ
€HTÌIHÁ	€HŠÌ FFÁ	€IWÌÎHÁ	€HMÎÏÏÁ

5 ddYbX]I '8 "&'%% GłUł]gl]WU '9j U i Uł]cb'Ë'K Y``; fci dg': ]gWU 'MYUf'&\$%9' : M'&\$%9'5 bbi U'F Ydcfh Hk ]b'7 ]l]Yg'5 fa m'5 a a i b]l]cbg'D`Ubh 5 fXYb'<]`gzA]bbYgclU



## ; fci d') '--'; `cVU'D`i a Y'

€IWÏ€GÁ	€IWÌIÌÁ	€IWÌÏÁ
€I WÏ €JÁ	€I WÌ Í FÁ	€IWÌÏJÁ
€I WÏ FFÁ	€IWÌÍG‱iæ)å[}^åÁ	€IWÌÌ€Á
€I WÏ FHÁ	€IWÌÍÍÁ	€I WÌ Ì FÁ
€I WÌ€GÁ	€IWÌÍJÁ	€IWÌÌGÁ
∖€IWÌ€ÎÁ	€IWÌ΀Á	G€€FÍIÁ
€IWÌHGÁ	€IWÌÎFÁanàæ),å[}^åÁ	GHIÍIÎÁ
€IWÌHHÁ	€IWÌÎHÁ	GHÍIJ
		[čoÁi-Ái^¦cã&^
€IWÌHIÁ	€IWÌÎIÁaaàa)å[}^åÁ	Ì€JÍIÏÁ
€IWÌIFÁ	€IWÌÎÍÁaaàa)å[}^åÁ	I€JÍIÌÁ
∖€IWÌIHÁ	€IWÌÎÎÁ	I€JÍIJÁ
€IWÌIIÁ	€IWÌÏFÁ	I€JÍÍÍÁ
€IWÌIÍÁ	€IWÌÏGÁ	Í FGÏ Î FÁ
€IWÌIÎÁ	€IWÌÏÍÁ	ÚRÀHFÌ Á
	<ul> <li>♥ WÏ €GÁ</li> <li>♥ WÏ €JÁ</li> <li>♥ WÏ FFÁ</li> <li>♥ WÏ FFÁ</li> <li>♥ WÏ FFÁ</li> <li>♥ WÌ €GÁ</li> <li>♥ WÌ €GÁ</li> <li>♥ WÌ €GÁ</li> <li>♥ WÌ €GÁ</li> <li>♥ WÌ €GÁ</li> <li>♥ WÌ €GÁ</li> <li>♥ WÌ €GÁ</li> <li>♥ WÌ €GÁ</li> <li>♥ WÌ €GÁ</li> <li>♥ WÌ €GÁ</li> <li>♥ WÌ €GÁ</li> <li>♥ WÌ €GÁ</li> <li>♥ WÌ €GÁ</li> <li>♥ WÌ ↓ ÉGÁ</li> <li>♥ WÌ ↓ ÉGÁ</li> <li>♥ WÌ ↓ ÉGÁ</li> <li>♥ WÌ ↓ ÉGÁ</li> <li>♥ WÌ ↓ ÉGÁ</li> <li>♥ WÌ ↓ ÉGÁ</li> <li>♥ WÌ ↓ ÉGÁ</li> <li>♥ WÌ ↓ ÉGÁ</li> <li>♥ WÌ ↓ ÉGÁ</li> <li>♥ WÌ ↓ ÉGÁ</li> <li>♥ WÌ ↓ ÉGÁ</li> <li>♥ WÌ ↓ ÉGÁ</li> <li>♥ WÌ ↓ ÉGÁ</li> <li>♥ WÌ ↓ ÉGÁ</li> <li>♥ WÌ ↓ ÉGÁ</li> <li>♥ WÌ ↓ ÉGÁ</li> <li>♥ WÌ ↓ ÉGÁ</li> <li>♥ WÌ ↓ ÉGÁ</li> <li>♥ WÌ ↓ ÉGÁ</li> <li>♥ WÌ ↓ ÉGÁ</li> <li>♥ WÌ ↓ ÉGÁ</li> <li>♥ WÌ ↓ ÉGÁ</li> <li>♥ WÌ ↓ ÉGÁ</li> <li>♥ WÌ ↓ ÉGÁ</li> <li>♥ WÌ ↓ ÉGÁ</li> <li>♥ WÌ ↓ ÉGÁ</li> <li>♥ WÌ ↓ ÉGÁ</li> <li>♥ WÌ ↓ ÉGÁ</li> <li>♥ WÌ ↓ ÉGÁ</li> </ul>	$\blacksquare$ Wì EGÁ $\blacksquare$ Wì IÌ Á $\blacksquare$ Wì EJÁ $\blacksquare$ Wì I FÁ $\blacksquare$ Wì FFÁ $\blacksquare$ Wì I Gảna trà â[}^â Á $\blacksquare$ WÌ FFÁ $\blacksquare$ Wì I Á $\blacksquare$ WÌ FHÁ $\blacksquare$ Wì I Á $\blacksquare$ WÌ €GÁ $\blacksquare$ Wì I ÉÁ $\blacksquare$ WÌ €GÁ $\blacksquare$ WÌ Î EÁ $\blacksquare$ WÌ HCÁ $\blacksquare$ WÌ Î Fána trà $\blacksquare$ WÌ HCÁ $\blacksquare$ WÌ Î I Ána trà $\blacksquare$ WÌ HAÁ $\blacksquare$ WÌ Î I Ána trà $\blacksquare$ WÌ I FÁ $\blacksquare$ WÌ Î I Ána trà $\blacksquare$ WÌ I FÁ $\blacksquare$ WÌ Î I Ána trà $\blacksquare$ WÌ I FÁ $\blacksquare$ WÌ Î I Ána trà $\blacksquare$ WÌ I FÁ $\blacksquare$ WÌ Î I Á $\blacksquare$ WÌ I I Á $\blacksquare$ WÌ Î I Á $\blacksquare$ WÌ I I Á $\blacksquare$ WÌ Î I Á $\blacksquare$ WÌ I I Á $\blacksquare$ WÌ Î I Á $\blacksquare$ WÌ I I Á $\blacksquare$ WÌ I Á $\blacksquare$ WÌ I I Á $\blacksquare$ WÌ I Á $\blacksquare$ WÌ I I Á $\blacksquare$ WÌ I Á $\blacksquare$ WÌ I I Á $\blacksquare$ WÌ I Á $\blacksquare$ WÌ I I Á $\blacksquare$ WÌ I Á

## ; fcid`)`Ib]h'`kY``g`flYjU`iUhYX`Ug`]bX]j]XiU`lfYbXgŁ

(€HŠÌ GGÁ	€HWÌ GFÁ	€HWÌ GGÁ	€HŠÌ CGÁ
I€JÍÍ€Á	I €JÍ JÎ Á	I€JÍ JÏ Á	€HWÌHFÁ
	æàæ)å[}^å	æàæ)å[}^å	æàæ)å[}^å

## ; fcid'\*'-'>cfXUb'5ei]2Yf'

€IR€ÏÏÁ	€IRÌHÌÁ	€I WÏ FHÁ	€IWÌÌGÁ
€IRÏ€GÁ	€IRÌHJÁ	€IWÌHÁ	ÞÓTÀHÁ
€RÏ€ÌÁ	€IRÌÌGÁ	€IWÌHÎÁ	ÞÓT ÀI Á
€I RÏ FHÁ	€IRÌIÏÁ	€IWÌHÏÁ	ÞÓT ÀÍ Á
€IRÌ CGÁ	€IRÌIJÁ	€WÌHÌÁ	ÞÓT ÀÎ Á
€IRÌHIÁ	€IWEÏÏÁ	€IWÌHJÁ	
€IRÌHÎÁ	€IWÏ€GÁ	€IWÌIÏÁ	
€IRÌHÏÁ	€Wï€ÌÁ	€IŴIJÁ	

- E ÚRÀÌ€GÁ, ‡I/Á, [ơáà∧Á, [}ãt; ¦∧åÁ, ¦Á •∧åÁ; ¦Á çæ; æz‡i}Á } / •••Á€I WÌ€GÁ; @[, •Á/ÔÒ &[}&^}dæz‡i} •Á; ¦^æz∿¦Ás@æ)ÁFÁ;]àÈ

#### HUV`Y'' !' ; fcid`%z8z'' z) zUbX`\*`AUbb!?YbXU``GiaaUfmizcf`CI% :M8\$%`5bbiU`FYdcfh Hk]b`7]h]Yg`5fami5aaib]h]cbg`D`Ubh 5fXYb`<]``gzA]bbYgcHJ



; fci d	G.JſĮI A	D'JƯi Y	F <sup>&amp;</sup> JՄi Y	:fUW]cb`cZ 8YhYW]cbg	FYgi `lg'HfYbX	H\ fYg\ c`X`Hf][[YfYX3	7 ca a Ybhg
; fcid`&`KY`q.							
I€IÍIJ	FÌ	€Ì€€H	€ÈÍI	Ï ÁÐÁ	0&\^æ ā *	Ÿ^∙	$P^{ab}$ Á ľ { $A^{b}$ } c $\tilde{E}$ ľ { $A^{b}$ $\tilde{B}$ ľ { $A^{b}$ $\tilde{B}$ $\tilde{B}$ $\tilde{B}$ $\tilde{B}$ $\tilde{B}$
I€JÍÍÏ	FJ	€Ì€€FI	€ÈÛ	Ï ÁÐÅ		Ÿ^●	$\dot{O}$ $\dot{O}$ $\dot{A}$
€HŠÎÏH	ËÌ	€È€€H	€ÈFI	ΪÆÅ	Ö^&¦^æ•ã*	jd	
€HŠÌHH	ËFH	€Ì€HÍ€	€ÈÎÍ	Ï ÁÐÁ	Ö^&¦^æði*	]d	
€HŠÌIÌ	Ë	€È€€ÍI	€ÈÏÎ	ï ÁÐÁ	Ö^&¦^æã*	]4	
€HŠÌÍJ	Ë	€È€€ÍI	€ÈÍI	ΪÁÐÂ	Ö^&¦^æã*	]4	
€HMÎÏÏ	ÞŒ	ÞŒ	ÞŒ	€ÁÐÁJ	ÞŒ	]4	ŒĮÁ₽Ö
€HWÌ€Í	FÍ	€È€FÍ€	€ĚÌ€	ΪÁΘÅ	Q&¦^æ∄*	Ϋ́^∙	Ŭ[˘c@:¦}Áヘå*^Á,-Á,[¦c@4, `{ ^Ê4, `{ ^Á @5eơ\åÁ ð1@4^
€IWÎÏH	Ë	€ÈFJ€	€È€€FÍÍ	ΪÁΘÅ	Þ[ÁÛðî}ãa&aa)oÁ/¦^}å	Ϋ́^∙	Þ^ælÁ[č@állč{^Á&^}cv¦Éállč{^Á@eevåÁlðt@dî
€IWÌGF	ËFF	€ÈÉÎÌ€	€ÈGH	ΪÁΘÂ	Ú¦[àæà ^ÁÖ^&¦^æ•ã;*	Þ[	
€IWÌHG	ËG	€ÈIH€	€Ì€€HÎ I	ΪÁΘÅ	Þ[ÁÚðł}ãa&æ)oÁ/¦^}å	Ϋ́^•	Ü^ æaãç^ ^Áxcæà ^ÉÁà^ç_^} ÅÎÂæ}åÅĨµ*EŠÁA]3&^ÁG€€Ï
€IWÌHH	ËGG	€È€€GÌ	€ĒĒ€ÏÍ	ìÆA	Ö^&¦^æ-ậ,*	Þ[	
€IWÌIF	Ë	€È€GÍ€	€ĚÌÍ	ΪÆΑΪ	Ö^&¦^æ-ậ,*	Þ[	
€IWÌIH	G€	Ł€È€€F	ÌÎÉ€	ΪÁΘÁ	Ql&¦^æe∄;*	Ÿ^∙	Þ^æÁj[`{ ^Á&^}@\
€IWÌIÍ	ËFG	€ÈÉÍFÍ	€ÈFï	ΪÁΘÁ	Ú¦[àæà ^ÁÖ^&¦^æeðj*	Þ[	
€IWÌIÎ	G€	Ł€È€€F	€ÈIG	ï ÁÐÁ	Q&\^æ₿*	Ÿ^∙	Þ^ælÁ, `{ ^Á&^} ♂¦É¥@ärq[¦ä&æl îÁ*¦¦ææä&
€IWÌIJ							Ù^^ÁÕ¦[ĭ]ÂÎÁĭ{ { æ'Ê
€IWÌÍI	Ë₽Î	€È€F€G	€ËHÌ	ΪÁÐÂ	Ö^&¦^æðj*	Þ[	
€IWÌÍJ	ËG€	Ł€È€€F	€ÈLJF	ΪÁÐÂ	Ö^&¦^æðj*	Þ[	
€IWÌÎFÁÇæàæ);å[}^åD	FF	€È€GÌ€	€ËÍG	ÎÁBÂ	ÞŒ	ÞŒ	O2aæ)å[}^åÁeee∿¦ÁGE€ÎÁræ{] ^ÊÁBjÁ⊳^,ÁÓ¦ã*@{}}ÁÖ^ç^ []{^}c
€IWÌÏÍ	Ë₽Î	€È€HF€	€ÈGIJ	I ÁÐÂ	Ö^&¦^æðj*	Þ[	
€IŴÏÏ	ËJ	€ÈÌÍ€	€ÈÉÍJI	FÍÁBÁFÍ	Þ[ÁÛðî}ãã&æ);oÁV¦^}å	Ÿ^∙	
€IWÌÏJ	GH	€È€GH€	€ÈHÎÌ	ÎÁBÁF€	Q&\^æ₿*		
GeÎÎÌÌÌ	Ë	€ÈGIÌ€	€È€Ë	ÎÁBÂÂ	Þ[ÁÛðî}ãã&æ);oÁV¦^}å	Ÿ^∙	
;fcid`%BD	Ë	€ÈÈÌF	€È€JÏF	Ϊ ÁÐÂ	Þ[ÁÛðî}ãã&æ);oÁV¦^}å	Ÿ^∙	
;fcid`%GD	€	€ĚÎH	G€F€	ΪÁΘÅ	Ùœà ^	Ÿ^∙	
; fci d'' <sup>:</sup>	Ë€	€È€JHÍ	€ÈHÍ	Ϊ ÁÐÂ	Ú¦[àæà ^ÁÖ^&¦^ærðj*	]¢	
; fcid`)	FF	€È€ÎÌ	€ÈÎH	Ϊ ÁÐÁ	Ú¦[àæà ^Á0,&¦^æ-ā,*	Ÿ^∙	
;fcid`)`Ib]h'`KY`g.							
I€JÍÍ€	Ë	€ÈGH΀	€ÈIG	ΪÁÐÄ	Þ[ÁÛðî}ã&æ);oÁV¦^}å	Ÿ^∙	Üæ;Ád^}åÁãarÁå∧&¦∧æeā;*
l€JÍJÏÁÇænàæ)å[}^åD	ËFF	€È€GÌ€	€È€J	ÎÁBÂN	ÞŒ	ÞŒ	OEaæ)å[}^åÁ\$u`^Á§[Á\$k[}•dÉĂ0Ee^\¦ÁG€€ÏÁræ{] āj*
l€JÍJÎÁÇanàaa)å[}^åD	Ê	€ÈF€G€	€ÈH	ÎÁÐÂ	ÞŒ	ÞŒ	OEaæ)å[}^åÅå`^Á¢[Á&[}•dĖĂOEe^\¦ÁOE€ËIÁiæ{] āj*
€HWÌHFÁÇæàæ)å[}^åD	J	€ÈEÎÌ€	€È€	GÁĐÂ	ÞŒ	ÞŒ	OEaæ)å[}^åÁå`^Á4[Á&[}•dÉACEe^\ÁQE€ËÄÁæ{] āj*
€HWÌGF	ËJ	€È€€FI	€ÈÍF	ÏÁÐÁ	Ö^&¦^æ•ậ*	Þ[	
€HWÌ GG	G	€ÈIH€	€È€GÍJ	ÏÁÐÁ	Þ[ÁÛðî}ã&aæ);oÁV¦^}å	Ÿ^∙	Ó^ç^^}ÁFG€Áæ)åÁF΀Áµ*EŠÁAğ8^ÁGE€H
€HŠÌGG	Ë	€È€GÍ€	€ĒJ	Ï ÁÐÁ	Ö^&\^æ•å;*	Þ[	
€HŠÌ €J	Ê	€ÈÍÍ€	€ÈJJ	ÏÁÐÄ	Þ[ÁÛðî}ã&æð}oÁV¦^}å	Ϋ́^∙	Üæ; Ásl^}åÁ≊iÁå^&l^ærā;*

Þ[c^•Áæ)åÁ0Eaà¦^çãæeã[}•Á[}ÁÚæ\*^ÁGÈ

#### HUV`Y'' !' ; fcid`%z&z'' z) zUbX`\*`AUbb!?YbXU```GiaaUfmizcf`CI% :M&\$%`5bbiU`FYdcfh Hk]b`7]h]Yg`5fami5aaib]h]cbg`D`Ubh 5fXYb`<]``gzA]bbYgcHJ



; fci d	G'JƯi Y	D'JƯi Y	F <sup>&amp;</sup> JƯi Y	:fUW]jcb`cZ 8YhYW]jcbg	FYgi`lg'HfYbX 	<u>H\ fYg\ c`X'Hf][ [ YfYX3</u> 	7 ca a Ybhg	
; fci d'* 'Cl %>cfXUb'K Y`g.								
€IRÌCG	ËFG	€ÈÈÌJ€	€ÌĤÍI	ìÁÐÂ	Ö^&¦^æ•ậ*	Þ[		
€RÌH	ËÎ	€È€F€G	€Ë€G	I ÁÐÄ	Ö^&¦^æ•ậ*	Þ[		
€RÌHÎ	FÌ	€È€F΀	€ĒÌH	ìÁGÁ	Q&¦^æậ*	Ÿ^∙	Ô [•^Á;\ [¢ā[āĉ Á[Á=>ÓÔÕÜÙÁ;^  •É4ă^ ^Ásj- `^}&^åÁs`Á@cå[;}	
€IRÌHÌ	FH	€Ì€HÍ€	€Ë€€	ΪÁΘÅΪ	Q&¦^æậ*	Ÿ^∙	Ô [•^Á;\ [¢ā[āĉ Á[Á=>ÓÔÕÜÙÁ;^  •É4jǎ^ ^Ásj- `^}&^å/ás`Á:@cå[;}	
€RÌHÏ	Ë	€ÈÎ J€	€ÈJI	ìÁGÁ	Þ[ÁÛðî}ã&æð)oÁ/¦^}å	Ÿ^∙	Ô [•^Á;\ [¢ā[āĉ Á[Á=>ÓÔÕÜÙÁ;^  •É4jǎ^ ^Ásj- `^}&^å/ás`Á:@cå[;}	
€IRÌHJ	€	€ĽÍIÌ€	€È€H	ìÁĐÂ	Ùœà ^	Ÿ^∙	Ó^[[_, Ă,Áµ* ĐŠÁ	
€RÌIÏ	ËÎ	€È€FFI	€ÈHGG	FJÁBÁFJ	Ö^&¦^æ∙ậ*	Þ[	Þ^ælÁ,   ~ { ^Á&^} c^{\	
€IRÌIJ	ÎÌ	€Ì€€€GÍ	€È€JG	ìÆAFì	Q&¦^æðj*	Ÿ^∙	Ó^∥[, ÁFÁµ*EŠÁ	
€IRÌÌG	ΒÍ	Ł€È€€F	€ĔÌÏ€	FÏ ÁBÁFÏ	Ö^&¦^æ∙ậ*	Þ[	O∰Á¤Ö	
€IR€ÏÏ	ΪÍ	€È€È€	€ÈĤI	FLÁBÁFI	Ö^&¦^æ∙ậ*	Þ[		
€IRÏ€G	ËÈ	€È€€H	€ĚJÍ	ΪÁÐÂ	Ö^&¦^æ∙ậ*	Þ[		
€ RÏ €Ì	FH	€Ì€HÍ€	€ĚÎÍ	ΪÁÐÂ	Q&¦^æ∄*	Ÿ^∙	Ù[čc@\}Á\å*^ÁįÁ,[¦c@4j, `{ ^Éj, `{ ^Á @áe^åÁ ã @{^	
€IRÏ FH	ÞŒ	ÞŒ	ÞŒ	€ÁÐÄ	ÞŒ	Þ[	C∰Á≎Ö	
; fcid`*`BYghYX`Ib]h(`I	K Y`g.		· · · ·			·		
€IWEÏÏ	ËI	€È€€ÍÏ	€ÈH€Í	Ϊ ÁÐÁFTI	Ö^&¦^æ∙ậ*	Þ[		
€IWÏ€G	ËG	€ÈIH€	€ÈÉÉÉÉEHG	ΪÁΘÅΪ	Þ[ÁÛðî}ã&æð)oÁ/¦^}å	Ÿ^∙	Ó^∥[, ÁHÁµ*EŠÁ	
€Wi€Ì	ËÎ	€È€F€G	€ËGF	IÁÐÄ	Ö^&¦^æ∙ậ*	Þ[		
€I WÏ FH	ËFF	€ÈEÎÌ€	€ÌHÍ€	ÍÁÐÄ	Ú¦[àæà ^ÁÖ^&¦^æ∙ậ/*	Þ[		
€WÌH	ËC€	Ł€È€€F	€ÈÎJ	ÍÁÐÄ	Ö^&¦^æ∙ậ*	Þ[		
€WÌHÎ	F	€Ĕ€€€	€È€FFÏ	ìÁĐÂ	Þ[ÁÙðt}ãa&æ)oÁ/¦^}å	Ÿ^∙	Ô [•^Á;\ [¢ā[āĉ Á[Á= ÓÔÕÜÙÁ;^  •É4ă^ ^Áş - ĭ^} &\akan A @ cå[; }	
€WÌHÏ	Ë	€ÌÈFÏ€	€ÌHÍÏ	ìÁĐÂ	Þ[ÁÙðt}ãa&æ)oÁ/¦^}å	Ÿ^∙	Üæç Ád∖^}åÁãa Áå^&¦^æeð) *	
€IWÌHÌ	€	€LĚÎH€	€ÈHÏI	ΪÁΘÂ	ľœà ^	Ϋ́^∙	Ó^∥[ , ÁHÁµ* BŠÁ ĝ &^ÁG€€J	
€IWÌHJ	HG	€È€€FÏ	€ÈÌJH	F€ËU&c	Q&¦^æ∄*	Ϋ́^∙	Ô [•^Á,¦[¢ã[ãĉ Á[Á⊃ÓÔÕÜÙĂ,^  •ÊĂã^ ^Áş]+,`^}&^åAŝ^Á@cå[,}	
€WÌIÏ	Ë	€ÈÈÌF€	€È€JGH	ΪÁÐÄ	Þ[ÁÛðî}ã&æð)oÁ/¦^}å	Ϋ́^∙	Üæ; Ásl^}å,/ãar/Ásl^ærð;*	
€IWÌIJ	FG	€È€ÍFÍ	€ËÌF	ΪÁÐÄ	Ú¦[àæà ^ÁQ,&¦^æ≉ā);*	Ϋ́^∙	Þ^ækÁ, ǐ{ ^Á&^}&^¦Ê&e‡]] ^æt•Á^ æaãç^ ^Áicæà ^Áāj}&^ÁG€FF	
€WÌÌG	ËF€	€È€JHÍ	€ÈH	ÎÁBÂ	Ú¦[àæà ^ÁÖ^&¦^æ≉ãj*	Þ[		

;YbYfƯ Ɓch¥g.

Ü^•][}•^Á/@^•@{|åÁstðt\*^¦•Ásst^Ásh^-ðj^åÁsjÁ/æsi|^ÁÖÈGÈÈÈÈ

#### 5 WichmagʻUbX`5 VVfYj]Uhjchg.

▷CEAMA, 「d+aj] | 器とcai | へ払く〉 â Á+aj æt • â Á, [ ơj, ^ |-{ | { ^â Á+az Á, @a Á[ & acatii } ▷ÖÂvÁ, [ ] Êa ~ c & c ▷ÓÔÖÜÙÂvÁ ▷ , ÁÓ! ă @( } ÅÔ[ } œt j æt °â /Ô`! [ ` } å, æt \ ÂÜ^ & { c^! ^ ÂŬ • c { ÚÁxæt ^ ÅvÁ ^ ] .^• ^ } o Á } & A \ cætii c /áj / k@ /ki ^ } å Ü<sup>G</sup>Xæt ^ ÅvÁ ^ ] .^• ^ } o Á & A \ cætii c /áj /k@ /ki acatii c /áj /k@ /ki ~ } å Ü<sup>G</sup>Xæt ^ ÅvÁ ^ ] .^• ~ } o Á & A \ cætii c /áj /k@ /ki acatii c /áj /k@ /ki ~ & A /ki acatii c /áj / L /ki ~ & A /ki acatii c /áj / A /ki acatii c /áj / A /ki acatii c /áj / A /ki acatii c /áj / A /ki acatii c /áj / A /ki acatii c /áj / A /ki acatii c /áj / A /ki acatii c /áj / A /ki acatii c /áj / A /ki acatii c /áj / A /ki acatii c /áj / A /ki acatii c /áj / A /ki acatii c /áj / A /ki acatii c /áj / A /ki acatii c /áj / A /ki acatii c /áj / A /ki acatii c /áj / A /ki acatii c /áj / A /ki / A /ki / }



A Ubb!? YbXU``G	A Ubb!? YbXU``D	HfYbX`7cbWig]cb
ÙÁNÆ	ÚÁLÁÐÁMÆÐEÍ	Q&¦^æj*
ÙÁNÆ	ÚÁLÁÐÁMÁ€ÈF€	Ú¦[àæà ^ÁQ)&¦^ærðj*
ÙÁM∕€	ÚÁLÁÐÁMÁEÐEÍ	∖lœæÙ
ÙÁ⊾Æ	ÚÁLÁÐÁMÁ€ÈF€	Ú¦[àæà ^ÁÖ^&¦^æ∙āj*
ÙÁ⊾Æ	ÚÁL ÁÐÁMÁÐ EÐEÍ	Ö^&¦^æ-ậ *
OĘ,^ÁCÙC	ÚÁNÆÈEÍ	Þ[ÁÛðî}ãã&æ);oÁ/¦^}å

## 5 ddYbX]I '8 "&"%" ' FYgdcbgY'H\fYg\c`Xg'Vm; fcid :M`&\$% `5 bbi U`F Ydcfh Hk]b'7]h]Yg'5fam5aaib]h]cbg'D`Ubh 5fXYb'<]``gžA]bbYgcHJ



ΚΥ¨; fci d	Di fdcgY	A YUgi fY	ˈH]a Y`K ]bXck# Acb]hcf]b[ ⁻: fYei Yb₩h	HYgh	FYgdcbgY H\fYg\c`X
Õ¦[ ˘] ÁF	ŒYÔÁQ{{^åãæe^\^Á Ӧ[,}*¦æåã?}ơ∱(-Á/ÕÜÙ	ŒYÔÁ∕¦^}å	ÎÁ^æ <b>'•िæ)</b> }ँæ¦	Tæ}}ËS^}åæ⊯Á	Ùcæà ^Ê400,&¦^æ-āj,*Ê4(,¦/ Þ[Á/¦^}å
Õ¦[ `] <b>Á</b> G	Ö^-ajaj*ÁÚ `{^ÁÙã^ÁÇŠ[,/ Ô[}&^}dæaaãi}ÁÔå*^∙D	Qlåãçããčaa†ÁY^∥Á/¦^}åÁ{[¦Á VÔÒ	FGÁ^æ•Ðaðr}}ãæ;	Tæ)}ËS^}åæ∥	Q&¦^æ≉ā),*Á(¦Á⊳[Á V¦^}å
Õ¦[≚] ÁH	ŒYÔÁQ{^åãeec^\^Á Ö[,}*¦æåā≹}ơ{(,-Á ÞÓÔÕÜÙ	CEYÔÁ∕¦^}å	FGÁ^æ∳•Ðàð}}ãæ¢	Tæ)}ËS^}åæ≬	Ùcæà ^ÊÃQ&¦^æ•ā}*ÉÃ,¦/ Þ[Á/¦^}å
Õ¦[č]Á	Šæe^¦æ‡ÁÇÔ ^æ}DÂÙ^}œ}^ Á Y^∥∙	Q\åãçãã过ÁY^∥Á Ô[}&^}c/æaāį}	FGÁ^æ!•Bàãr}}ãæ;	Qlåãçãã≚æ‡Á Ô[}&^}cæaã[}∙	Õ¦^æe^∖¦Ás@ee)ÁÜUÖÁ *[憕
Õ¦[č] Ä	Õ∥[àæ4ÁÚ ǐ{^ÁTæ∙•Á Ü^å`&aã[}}	ŒYÔÁ∕¦^}å	FGÁ^æ'•Ðàðà}}ãæ;	Tæ}}ËS^}åæ∳	Ùcæà ^Ê400,&¦^æ•ā}*Ê4(¦/ Þ[Á/¦^}å
Õ¦[ ˇ ] Â	Òçæ‡ੱææ∄*Áæ)åÁ&[{]æ÷∄*/ d^}å∙Á§iÁR[¦åæ)áÆEĭã^¦	Q:åãçããŭ æ‡ÁY ^∥Á/¦^} åÁ{[¦Á VÔÒ	FGÁ^æl•Ðaða}}ãæ¢	Tæ)}ËS^}åæ∣	Ùcæà ^ÊÁQ&¦^æ-ðj*Á(¦Á Þ[Á/¦^}å

; YbYfU`BchYg. CEÁÜ^•][}•^Á/@^•@[¦åÁsa Ás@ Ás^•cÁ^•č|c@ DÁs@eenádiði \*^¦•Áč¦c@;¦Á^•][}•^ÈÁÙ^^Ás^¢cÁ{[¦Áseá å ãaā[}}ædÁ\*¢]|æ)æaā[}Á[,-Á^•][}•^Á];[&^••È 5 Wichma g'UbX'5 VVfYj ]Uhjcbg.

OEY ÔÁMÁOE^æEY ^ãt@e^åÁÔ[}&^}dæaā[}

5 ddYbX]I '8 "&'%(' 9 j Ui Uh]cb'DfcWYgg': M'&\$% ' : M'&\$% '5 bbi U'FYdcfh Hk ]b'7 ]h]Yg'5 fa mi5 a a i b]h]cbg'D`Ubh 5 fXYb'<]`gzA]bbYgchU





5 ddYbX]I `8 "&'%) ` FYgdcbgYg'hc`H\fYg\c`X`=bX]WUhcfg`: ]gWU`MYUf`&\$%` : M`&\$% `5 bbi U`FYdcfh Hk ]b`7 ]h]Yg`5 fa mi5 a a i b]h]cbg`D`Ubh 5 fXYb`<]``gžA ]bbYgcHJ`



### : 57 HCF G'HC '7 CBG=89 F

- -Á Ô[}œa{ājæ}o%&[}&^}dæaā[}•Á
- $\dot{A} = \dot{S} [ & a = \dot{a} ] \dot{A} = \dot{C}^{+} (a = \dot{A} = \dot{A} ) \dot{A} = \dot{A}$
- -Á Ù ̈́¦¦[̆]åậ̃\*ÁåæææÁ́
- -Á Üãi\•Áų Á@ { æ) Á@ æ¢o@Á;¦Ás@ Á?}çã[}{ ^}cÁ
- -Á Þ^^åÁ[¦Á¦\*^}&^Á§Á^•][}•^Á
- Á

## DC GG=6 @ '9 J 5 @ 5 H=C B 'F 9 GDC BG9 G'

- -Á Ú^¦-{¦{ Áseå åãã{}} æ¢Á;¦Á&[}-ã{ æã{}} Áræ{ ]|ð]\*Á
- -Á Y¦ãz^Á]Á§JÁc@^ÁOE;}`æ|ÁÚ^¦-{¦{ æ)}&^ÁÜ^][¦oÁ |
- -Á Ú^¦-{¦{ Á^] ælæe^Á^çælĭ æaāį} Áæl) åÅ; ¦ãe^Ë] ÁÇ/^&@AT ^{ [DÁ
- Á

### DC GG=6 @ '@CB; !H9 F A 'F 9 GDC B G9 G'

- -Á Q\&¦^æ^Á;æ{]|ð]\*Á;<sup>/</sup>``^}&`Á
- -Á T[åã÷Á]^¦æēā]}Á;~Á^{ ^åãæbÁ^•c^{ QDÁ
- -Á Ú^¦-{¦{Å,^ Á^{ ^a^ A^cat }
- -Á Q,∙cæ)|Áseååãqãį}æ)Á [}ãq[¦ã)\*Á,^||Ç,DÁ
- -Á T [ åãî Ác@ ÁU] ^ &ãæ‡ÁÝ ^ ||ÁÔ[ } d Šcāį } ÁOE^æÁ
- -Á Ô[}d[|Áãa∖ÁæaÁa@A^&^]d[¦∙Á
- Á

BchY.Á V@^•@[¦åÁ^•][}•^•Á[Áà^Áå^•&¦ãà^åÁæ)åÁ?çæ]\*æz^åÁ§jÁ@?ÁOE;}\*æjÁÚ^¦-{¦{æ}}&^ÄÜ^][¦o•ÈĂ Á








































### :][ifY'8"&" !% BYk '6f][\hcb'Aib]W]dU'KY`g.FY[fYgg]cb'5bU'ng]g'G]bW/'%-,.'Hf]W(`cfcYh\YbY ØŸÁG€FJÁCE] \* æ4ÄÜ^][¦cÁ V,ã, ÁÔãa2t•ÁCE{ ^ÁCE{ { `} } ãa1[}•ÁÚ|æ}c OEtå^} Á?ā]•ÉAT Þ





## :][ifY`8"&"'!& BYk`6f][\hcb`Aib]W]dU`KY`g.`FY[fYgg]cb`5bUmg]g`G]bWY`%-,.`Hf]W{`cfcYh\YbY

ØŸÁG€FJÁQE;}ĭæ¢ÁÜ^][¦cÁ V,ājÁÔãa21•ÁQE{ ^ÁQE;{ ĭ}ãaāį}•ÁÚ|æ);c OEå^}Á?ā∥•ÉATÞ





# **APPENDIX E**

KY``**=**bjYbhcfm



5 ddYbX]I '9' K Y``=bj Ybhcfmil dXUhY': ]gWU''MYUf'&\$%' : M&\$% '5 bbi U'FYdcfhi Hk ]b'7 ]h]Yg'5 fa m5 a a i b]h]cbg'D`Ubhi 5 fXYb'<]``gz'A ]bbYgchU



#### %<sup>\$\*</sup> DI F DC G9<sup>•</sup>

V@^Á,`¦][•^Á;Á,^\|Á5jç^}d[¦^Á5aÁ;Á5aå^}cã≏Á,^||•Ás@eecÁ@eeç^Á5a^^}Á5i]æ&c^åA;¦Á&[`|åA;[c^}cãe¢|^Ás^Á5i]æ&c^åÁ à^Á&[}cæ;jaæ)o°Á√[{Ás@~Á⊳^,ÁO;ä?@[}500Eå^}Á?j≬eÂU`]^¦~}åÂÛãe^ÈĂ

#### &'\$' 657?; FCI B8'

Ö^ç^|[]ā)\*Áxa)åÁ(æanjocaanjā)\*Áx@Á,^||Ánjç^}d[¦^ÁarÁxaAj¦[&^••Áx@eecÁ,æe ÁnjãnaaneevåÁnjÁFJJFÉA,ão@Ax@Á,[¦\Ár⊶[¦orÁ å[&ٽ{ ^}cvåÁnjÁ^çç\aapÁ]åæevÁ^][¦orÁrāj&^Áx@eenÁanj^ĚÓ^\*āj}āj\*ÁnjÁo?ŸÁFJJJÉAx@Á]åæevÁ^][¦cāj\*Á;æe Á āj&[¦][¦æevåÁnjd[Áx@ÁOEj}`æahÁU/\¦-{¦{ ænj&AxÂU/>][¦orĚA

V@Á,^||Áajç^}d[¦^Án⊌cčå^Áad^ædÉAæe/Áa^aj^å/Áa^Áa@ÁTāj}^•[cæÁÚ[||čcāj}ÁÔ[}d[|ÁOE\*^}&?ÉÉAiA`@Q\_}}Át}A Øātč¦^ÁOÉEÉAæjå/Á&[āj&ããa^•Á,ãc@Ác@ÁTāj}^•[cæÆÖ^]ædq{^}o/tj~ÁP^æ¢c@ÁQTÖPDÁU]^&ãæd;ÁY^||ÁÔ[}•dč&cātj}Á OEF^ædĚĂ

V@\ásĕ`ã^¦∙Áţ-Á&[}&^¦}Áse^^£a^aj^åAsî^Ás@A`Aµ\*ESSÁSB&@[[[^c@}}^Á&[}q[`¦Aţ'\Ás@AN}ãAHÁsejåAÄ N}ãAÁ ásĕ`ã^¦•ÉasejåAs@AFAµ\*ESSÁ&ãËËEÊEËä3&@[[¦[^c@}}^Á&[}q[`¦Aţ'\Ás@AN}ãAFÁsĕ`ã^¦ÁseaÁs@A,[¦c@A`}åAţ-Á UWCEĂ

V@^Ánad^æaf(-Á&[}&^\}+Á[¦Ác@ÁW}ãAh-Kaa)åÁW}ãAh Áaĕčã^\+Á&i^æz^åAs\^æz\*åAs^Áaæååā)\*Áæáčä&c\*¦Á(ā)^Áač~~^¦Áad^æá [čorāā^Ác@Á[Áu\*EŠÁd3&@[|[^c@}}^Á&[}q[č¦ÈÅV@/Áæd^æ4f(-Á&[}&^\}Á[¦Ác@ÁW}ãAh ÁæjåÁW}ãAh Áæččã^\+ÁæjÅ •@\_\_}{Á[}Ácãčč¦^ÁOĖEĖÅ

V@~Áæah^æa∯,~Á&[}&^\}ÁU;¦Á@~ÁN}ão/FÁæĕ≚ã^\/Á;}Ás@^Á,[¦c@Aháãa^A∱,~ÁUWGA%aiAå^/ã;^ææ^å.Áa^/Ásãô:Ád^^orÈÁ V@.Áæah^æa∯,~Á&[}&^\}ÁU;¦Ás@^ÁN}ão/FÁæĕ≚ã^\/ÁsiÁ:@{\_\_}}Áj}Á©2#;<sup>\*</sup>/ÁÒ⊟HÈÁ

Y^||•Á, ão@3,Ác@Árč å^Áeb-?æÁeb-^Á&æe^\*[¦ã^åÁaæ•^åÁi;}Á[&ææāj;}É&a^]c@20ĕčã^¦É&eb;åÁ•^ÈAY^||Á&æe^\*[¦ã••Ái;¦Á c@Á,^||Á5jç^}d;¦^Áeb-^Ási-^aÁsjÁ/æà|^ÁÔËEĚĂ

#### ''\$` DFC; F5A F9EI - **F**9A9BHG`

V@·Á,^||Æj,ç^}q[:^Á,i[\*¦æ; Á^˘˘ā^{ ^}o Á@eç;^Á?ç[|ç^åAj,ç^¦Áaā]^ÊAj,ão Ø&@ea)\*^•Æi[&č{ ^}c^åAs@[č\* Øxb@·Á č]åæc>Á^][¦o ĔADE4[] &@edoá@ec#å^•&¦ãa^•Ác@ Áse}}ča4A^čĭā^{ ^}o Aj[¦Á; æðj œðj,ā]\*Ás@ Á, ^||Æj,ç^}q[¦^Á åæcæbaæ ^ÆiÁ:@q, }Aj;Á2äč'¦^ÁOË ĚÜ^ččā^{ ^}o Áse+^Á`{ { æðã^åÆs^|[,ÈA

Þ^ælÁ@/Áa^\*āj}āj\*ÁţÁ^æ&@Áa® &ædÁ^ælÉandáaææææ^ÁţÁ`á čå^Áed^æ4ç^||•Áa®Áæ&ččā^åA4[{ÁœlÁTÖPÉA/@ælÁ TÖPÁsæææææ^Áč^\^ÁaşÁāţã<raveba4 (Ácčå^Áed^æ4ç^a4)</a> (||•Áæææåæ^Á%[}•å</a> (||•Áa%ææå ^||•Áa%ææå ^||•Áa%ææå ^||•Áa%ææå ^||•Áa%ææå ^||•Áa%ææå ^||•Áa%ææå ^||•Áa%ææå &|[•^åAşÁœA ] ¦^çājč•Áās&æ¢Á^æÈA/@ÁTÖPÁsæææææA&{[}•ãoAţÁs@^^ÁæoKá

- Ô[}•d`&c^åÁY^||•ÁÇ^}^¦æe^åÁs@[`\*@Áå¦å|^¦•Á`à{ãcā}\*ÁY^||Ása}åÁÔ[¦ã;\*ÁÜ^&[¦å•D\_
- Ù^aa¦^åÁY^||•ÁÇ^}^!aæ^åÁs@[`\*@ásilā]^!•Á`à{ãcā]\*ÁY^||ÁÙ^aabjā\*ÁÜ^&[|å•Dúáb)å
- Öãr&|[•^åÁY^||•ÁQ; æå^Á}[, }Ág@[`\*@Á;[]^;c´Á;!æ}•~;bÈ

Yão@Ás@Á,^\_ÁTÖPÁ5j-{¦{æaā}}Ê5x@Á,^||Á5jç^}d[¦^Ásææææææ^Á5arÁ]åææ°å/ka`Á^&ææ°\*[¦ãāj\*Á,^||•É8æe Á }^&^••æ^Ê5eejå/ka`Ásæååāj\*Ásej^Á,^\_Á,^||•Á@æe%as^Ajão@jAs@Aică^AseAæEXD;^Á,^\_Á,'||•Á[`}å/kajÁ Ôææ^\*[¦ð\*•AræEAràEAr&EAGeEAGAEXCaEAGAEAGAEAASA\*^c^å/A[¦Áræ4]]äj\*KajÁs@æe/Air&&aeAA^æelAQ;^c^¦E5eejÁseec^{]cA d[Á^&Jæe•ã~Ásej^Á,^\_Kææ\*\*[¦^Áæ4,^||•Á;ā]ka^A(;æå^Ajka^A;aek^A;kat]iaj\*E4Y^||•Ás@æe/seAA^A;[cAræ4]]^å/kat`^ÁtjÁ }[]Ë^•][}eāç^Á, ^||Á;\_}^+•ÁseAsæ\*\*c\*åÅt[¦Áræ4]]äj\*KajÁs@AjA^¢cA;æ4t[j]äj\*ÁtjÁsæ4]]äj\*ÁtjÁsæ4 5 ddYbX]I '9' K Y``=bj Ybhcfmil dXUhY': ]gWU''MYUf'&\$%' : M'&\$% '5 bbi U'FYdcfhi Hk ]b'7 ]h]Yg'5 fa m5 a a i b]h]cbg'D`Ubhi 5 fXYb'<]`gžA]bbYgcHJ



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Ôææ^\*[¦^ÁÁÁ ^||•Áse^Ás@, •^Áã@ÁsejÁ`}}[,}Ás^]c@á;¦Á`}\[,}Á[&ææā;}Éá;lÁs[c@Ádā^æ|^Êá@;l^Á@, \*@`|åAsA´A }[Á, ^||•ÁsjÁÔææ^\*[¦^Á EÓæ&@á^æE≦sejÁseæ^{]c%siÁ;æå^At[Á^&]æ•ēã^ÁÔææ^\*[¦^ÁÁ Á ^||•Ásjd[Á;}^Á;Af@Af@As@A &ææ^\*[¦ã•ÈĂ/@ärÁssiÁse&&[{]]ã@ @åÁs@[`\*@Á]@}}^Á&æ4]•Êá^cœ'¦•ÊásejåЦ¦ÁãcAfãããarÁ[á`àæasjÁseåããā;}æ4Á āj-[¦{æaā;}ÈÁCE;^Á, ^||•Á,@a&@áse^ÁA^E3|æ•ãã\åÁseAÔææ^\*[¦^ÁFæÉ4FàÊ4F&É4OæÉ4CàÉ4;¦ÁG&áse^Áæa\*^c^åA{[¦Á •jæ{]]a]\*ÁsjÁs@æÁã=&æ4Á^æEÁ

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 Ø[ : Áxæ&@Áæţ ] |ā,\* Áxç^} dĚázÁsy ^ Á, ^ || Á@ze Ástán < & Gát } Á</td>
 @Bk@Áx & & Andrew &

V@?Áæ}}`æ¢Á^][¦cāj\*Á^``ãl^{^}orÁ{¦Ác@?Á¤^, ÁÓ¦ãt@{[}EDEtå^}ÁPā]|•ÁÙĭ]^¦~`}åÁÙãc^Á;^||ÁB;ç^}d[¦^Á;ā||Á āj&|ĭå^KÁ

- Á
  - $A \quad OE / \tilde{a} \circ / (A \to A)^{(-)} / (A \to A)^$
  - Á OE; æ † @ 36æ; á Ásæ Á \* { { æ † Á; Á æ { ] | 3; \* Á ~ { ¦ or Á; [ { Ás@æe Á ã & æ þ Á ^ æ È Ă
  - $\bullet \dot{A} = U^{8} \left[ \left\{ \left\{ \right\} a_{2} = a_{1} \right\} + \dot{A} = a_{2}$
  - •Á CE;Á]åæe^åÁ;^||Á\$jç^}d[¦^Áåæææàæe^Ás@æeAã@œeAã@@eA;^||•Áà^Á;^||Á&æee^\*[¦^ÈĂ
  - ●Á CBĘÁ]åæer^åÅåæææàæer^Áfãrcāj\*Á,æer^¦ÁĭæhãĉÁţrÁ,^∥•ÈÁ

### ('\$' : M`&\$% `I D85H9`

V@Á] åæc^åÁTÖP Áåæææàæe^Á æ Á,¦[çãå^åÁţ ÁDE&æåã Á;}Áæð ざæ^ÁGFÉAGEGEÈATÖP Á\*^}^¦æc^Á@ Áåæææàæ^Á -{[{Á]^&ãæC^á{A}`] • @3] ÉÄÜæ)\*^Éæd åÁÙ^&cāt }ÁåæææÈA/@3\*Á&[{]¦^@}•ãç^Áåæææàæ^Á,æ Á&{^^}åÅ¢dæ&oÁ c@ Áã or Á; Á, ^||•Ás@æçÁ,^¦^Á&[}•d`&c^åÉåã &{[•^åÉ4, ¦Á^æd^åÅå^c, ^^}áU&e; C@FJ Ě4Ø`¦c@'¦Á\$jç^•cãtææãç^Á~{¦or Á, ^\^Á,¦ãt ætāî Á{&`•^åÁt}}Åå^c\*{{3}}3\*Á>æ&@Â,^|[qA[&ææãt]}Á§3•ãa^Á;!Á [`orãa^Ás@Ácčå^&e\*aæåd}åÐ]¦Ásd^æa∱, Á&[}&^!}DÉAcæč•ÁÇá&cãç^É&t}æ&cãç^ÉAt;!Á^æd^åDÉ&d}åÅ,æc^!Á`•^Á @\$`]]|^Ð][}Ë`]]|^DÉA

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Öãr&l[•^åÅ ^||•Á@ææÁ ^¦^Áña^} cãðråÁæe Aà^ā \* ÁðjÁ •^Éðjæ&cãç^ÉA ^æd^åÉA ¦Aţ -A`}\}[]}A cæeč •Áæ)åÁs@æeÁ ^¦^Á å^c^¦{ā}^åÁg Ááz Áð ãc@ðjÁc@ Ácčå^Áæ⁄æÁæ^æÁæ^Áña^}cãðråÁðjÁ/æà|^ÁÔÊ HÉÖãr&l[•^åÅ ^||•Ás@æeÁ ^¦^Á |[&æeråÁ ãc@ðjÁc@ Áæ^æA Á& }& }}A æð åÁs@æeÁs@ AT ÖP Aña^} cãðråÁæ Á@eçðj\* Áæ&@æð\* ^ÁðjÁ cæeč •Á¦{ Áæ&cãç^Aţ ¦Á ∄æ&cãç^Åg Áræda^åÁ ^¦^Áč¦ }&^\; 4 æ?ið com at ærååÁg ¦Á&]}a{ æeðj}Á; As@ãÁræda A cæeč •ÉACE; ^Á ^||•Ás@æeÁ ^¦^Á 5 ddYbX]I '9' K Y``=bj Ybhcfmil dXUhY': ]gWU''MYUF'&\$%' : M'&\$% '5 bbi U'FYdcfhi Hk ]b'7 ]h]Yg'5 fa m5 a a i b]h]cbg'D`Ubhi 5 fXYb'<]`gZA]bbYgcHJ



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Ù^æ†^åÁ, ^||•Á, ^¦^ÁĘ`}åÁsî^Á^çã\*, āj\*Ás@ATÖPÁ^æ†^åÁ, ^||Áãa dĚY ^||•Ásá^}cãa?åÁse Á^æ†^åÁse^Á @{,}}ÁsjÁ Væà|^ÁOË ÈY ^||•Ásá^}cãa?åÁse Á^æ†^åÁsjÁs@ATÖPÁsæææàæ\*^Á]åæe?•Á, ^¦^Áse•ã}^åÁs[ÁÔæe?\*[¦^Á;æÈÁÁ Á

ØŸÁGEFJÁ, æsÁ,[ofszef4‰,æbþ;|+Á,^||Ábj;ç^}d;|^Á;æe;]|ðj\*Á;ç^}dÉÅ,@38&@4%,&&`¦Á;ç^¦^Át[`¦Á^æei/ÁsbjåÅ,@38@4xæei^oA c@Á,^||•ÁbjÁÔæe^\*[¦ðt•Áræa£ÁràbÄr&BÄGæa£ÄGàbÄG&BÄsbbjåÁ;æbŽv@Á,^¢o4(;æbbj¦Á,^||Ábj;ç^}d;|^Á;æei]|ðj\*Á;ç^}oÁ,ðµÁ [&&`¦ÁbjÁOEGEÈ

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## **K 9 @@=BJ9BHCFM'85H565G9** Á

Á Á V@ÁY^||ÁQç^}d[!^ÁÖæææèæ•^Á¥iÁ[&ææ^åÁ[}Á c@ä^ÁÔÖÁ§Á@Á[||[, 引\*ÁTæ3¦[•[-ơÁÔ¢&^|Áa]^ká Á Á Ý^||ÁQç^}d[!^ÁTæ3jÄÖæææèæ•^Á⁄QŸÁO€F9È¢|•Á

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#### HUV`Y`9!% KY``=bjYbhcfm7UhY[cfm8YgW]dh]cbg :M&\$%`5bbiU`FYdcfh Hk]b'7]h]Yg`5fam5aaib]h]cbg`D`Ubh 5fXYb`<]``gžA]bbYgcHJ



7UhY[cfm	GiVWUhY[cfm	91 d`UbUhjcb
		Yæe^{Á*]]^Á,^  •Á&\^^}^åÁ§,Áe),Áeĕ*ã^{A;Á;,Á&[}&^;}Ê&),•ãe^Áo@,Áee^æ4;,Á&[}&^;}ÈAY^  •Áee^Å&ãçãe^åŧ;d;Ác@.Á;  [_,ā]*Á*à&æe^*[¦ðr•K
	Fæ	Ö¦aj∖aj*Á, anec∧¦Á, ^
	Fà	Þ[}å¦ā}\ðj*Á&čoÁj[••ãa ^Á&[}œ&oÁjæe^¦
F	F&	Þ[}å¦ā]\ð]*ÉÅj[}&{[}cæ&oÁ;zæ^¦
	Få	Y^  Ááā/Áðj[]^¦æà ^Á∱¦Á@æeÁ,[ơáà∧^}Á•^åÁĮ¦Ái^ç^¦æþÁ^æb•
	F^	Y^  Á{{¦Á,@3&@4x@xÁ,}}^¦Á@ee Á^~`•^åÁQ;¦Á@ee Áa^^}Á`}!^•][}•ãç^Á{[Dáea)ÁDE{^Á;~~\'Á{¦Áœàæ)å[}{ ^}@3&@4x@6@Á,æe^\'Á•^Á@ee Áa^^}Áa^^{^åÁ
		^ ssa [^&sa
		Yæç\'Á`j]]^Á,^  •Áş,Áæj,Áæ^æAt,Á&[}&^\}Át,'Áş,•ãa^Ác@Ás`~^\'Áā,^•Ás`Qt`orãa^Ác@Ásc^æAt,Á&[}&^\}ÊAt&\^^}^åAş,Áæj,Áæj,Áæj,Áæj,Áæj,Áæč`ã^\'At,Á&[}&^\}ÈÁtY^  •Ásc^Ásią;ãa^åÁ
		ậ đá@ Á{ ∥[, ậ * Á čà&æe^*[¦ã∿•K
G	Gæ	Ô¦āj\āj*Åjæev\¦Åj^
G	Gà	Þ[}å¦ā]\ð]*ÁðičoÁ][••ãa ^Á&[}cæ&oÁ;æe^\
	G&	Þ[}å¦āj\ðj*Ēðj[}&[}œæôdý,æe^\
	Gå	Y ^   /\$ /\$ [] ^ ¦æa  ^ /{t   /\$@@ A [ 0 & ^^ } A • ^ a A [   A ^ ç^   æA ^ æ4
н		Y zec\'A`]] [^A, ^  •A, ārcēj, ka@ AUc`å^ACE^zekozenkec^A^ārc@ \A[`orāa^Ac@ Aec^zen[~4&[}&^\} E4,\Aec^A, ārcēj, Ac@ Aec^zen[~4&[}&^\} As`okec^A,[on\&\^^}^åAij, Aej Aec`ā^\A
		[-/&[}&^\}E
		Yæev\A`]]^A,^  •A,ão@4,ã•ā,*A5,-{;{ æeā;} B&iã;ãå^åA5,qfAc@eA;   [,ā,*A`à&æev*[¦ã•K
I	l æ	W}\}[,}A\$a^]c@A[;A\$eč`ã^;E8a`cA[[&aee^å/A\$jA\$c@:A8e^aea[[.~A8[]}&^;}E
	là	<u>₩}\}[,}A[&amp;aæaā[}Ebai´oA][o^};caæaļ^A[&amp;aæo*aA, ão@ajAo@oAUc`a^AOE^aebEAY^  •A, ão@ba[c@bae)A'}\}[,}Aa^]c@bae}a'Aee}A'}\}[,}Aa</u>
í		Y^  •As@een/bet^A\$jAs@Arc`å^Abet^aeE&s`oAs@een/@ee;^Asi^^}A&r\åA&@&\^åAbe}åA;[o4{&aeer*åEMP[A~;c@;!Abe&ca[}}A\$rA^&[{{ ^}å^åA{;!As@•^A, ^  •E
		Þ[}•`]] [^A, ^  • Aŷ; lã, ædā^A, []} ãd, lâ, *A, ^  • DE
÷		U^æ†^åA[:}&eeaiæ)å[]}^åA_^^  •BAY^  •Aed^&äçãå^åA\$jd[As@A[  []]]*A`à&eez^*[;18}•K
I	l æ	O[&`{ ^}c^åAeeA^^adaaaaaa}aaja[}^a
	là	W}å[&ٽ{ ^}♂åAsee A\^ae\^åE4\; A§[ ]\[]^\ ^Aseàae)å[}^å

#### HUV`Y`9!& 7 cbglfiWhYX`K Y``g : M&\$% `5 bbiU``FYdcfh Hk]b'7]h]Yg`5fam5aaib]h]cbg`D`Ubh 5fXYb`<]``gžA]bbYgchU



Ib]eiY	71 W ofm	@UghiBUaY`cf`6ig]bYgg`	CHYVh	7 1km		o Vala	8 UhY'	K Y``]b`
Bi a VYf		BUa Y	Girm	<b>7</b> Juni	ı yı	orun	8 f]``YX	8 UHJVUgY3
ÌFHHÏ	Î	Úĭà a&AÛd[¦æ*^	FIIFÁ?~`}cāj*Áxæ∦^^ÁÜåÈ	ÙdĂÚæi	Ò ^çæ[[¦Á⁄ ^  Á	΀	FÐÍЀ€FJ	Ϋ́
Ì FHH Ì	Î	Úľà a&ÁÙd[¦æ*^	FIIGAP~`}cā),*ÁXæ∦/^^ÁÜåÈ	ÙdĂÚæĭ	Ò ^çæ[ ¦Á⁄ ^  Á	΀	FGED€ED€FÌ	Ϋ́
Ì FHH J	Î	Úĭà a&AÛd[¦æ*^	FIIHÁP°}cāj*Áxæ∦^^ÁÜåÈ	ÙdĂÚæĭ	Ò ^çæt[¦Ár ^  Á	΀	FGÐFHBD€€FÌ	Ϋ́
Ì FHHÍ €	Î	Úĭà a&AÛd[¦æ*^	FIIIÁ?°`}cā)*ÁXæ∦^^ÁÜåÈ	ÙdĂÚæi	Ò ^çæt[¦Ár ^  Á	΀	FGÐÐB€€FÌ	Ϋ́
Ì GÍ €GJ	Î	Úĭà a&AÛq[¦æ*^	lÍ΀ÁÔ^}dæµÁ0Eç^bÄpÒ	Páļd[]	Ò ^çæt[¦Á∕^  Á	GÍ	FGEOFED€FÌ	Ϋ́
ÌGÍ€H€	Î	Ú°à ã&ÁÛq[¦æ≛^	IÍÎFÁÔ^}dæ∲ÆÇ^ÈÄ⊳Ò	Pã∥₫]	Ò ^çæt[¦ÁY^  Á	Ĝ	FGÐÎÐG€FÌ	Ϋ́
ÌGÍ€€	Î	Úæ\ÁÚ¦[]^¦æ}•	GHGIÁY^& ã-ÁÛdÈ	ÙdĂÚæ	Ò ^çæt[¦Á∕^  Á	ΪF	FÐFÍÐG€FJ	Ϋ́
ÌHHÏŒÍ	Î	ÔÖTÂU{ãt@	híáf 82406;^ĚapÒ	Tậ}}^æ}[ ã	Ò}çã[}{ ^}cæ‡ÁY^∥	G€	IÐHBЀFJ	Ϋ́
ÌHHÏGÎ	Î	ÔÖTÁÙ{ão@	HÎ I Ï ÁÚ& ¦&^ÁÚ ĐĂ>Ò	Tậ}}^æ}[ ã	Ò}çã[}{ ^}cæ‡ÁY^∥	G€	IÐHBG€FJ	Ϋ́
ÌHHÏĞÏ	Î	ÔÖTÂU{ão@	HÎ I Î ÁÔ´ &@ee) æ) ÁÙdÊk>Ò	Tậ}}^æ}[ ã	Ò}çã[}{ ^}cæ‡ÁY ^∥	G€	IÐBB€FJ	Ϋ́
ÌHJFÍÏ	Î	TÞÚÔŒ	GH åÁQĘ∧ÈÁÙ	Tậ}}^æ}[ ã	Ò}çã[}{ ^}cæ‡ÁY^∥	FÌ	FFÐFHBQ€€FÌ	Ϋ́
ÌHJFÍÌ	Î	TÞÚÔŒ	GH¦åÁ0Eç∧ĚÂÚ	Tậ}}^æ}[ ã	Ò}çã[}{ ^}cæ‡ÁY ^∥		FF₽FHBD€€FÌ	Ϋ́
Ì HJFÍ J	Î	TÞÚÔŒ	Væ∦æ*^Á0Eç^ĚÜÒ	Tậ}}^æ}[ ã	Ò}çã[}{ ^}cæ‡ÁY ^∥	FÎ	FF₽FGED€€FÌ	Ϋ́
ÌHJF΀	Î	TÞÚÔŒ	Væ∦æ*^Á0Eç^ĚÀÙÒ	Tậ}}^æ}[ ã	Ò}çã[}{ ^}cæ‡ÁY ^∥	HÍ	FF₽FGED€€FÌ	Ϋ́
Ì HJFÎ F	Î	TÞÚÔŒ	GG}åÁQE;^ÈÁÙÒ	Tậ}}^æ}[ ã	Ò}çã[}{ ^}cæ‡ÁY ^∥	GG	FFÐFÍÐG€FÌ	Ϋ́
Ì HJFÎ G	Î	TÞÚÔŒ	GG}åÁ0⊊∧ÈÁÙÒ	Tậ}}^æ}[ ã	Ò}çã[}{ ^}cæ‡ÁY ^∥	ÍG	FFÐFÍÐG€FÌ	Ϋ́
ÌHJFÎH	Î	TÞÚÔŒ	GG}åÁQE;^ÈÁÙÒ	Tậ}}^æ}[ ã	Ò}çã[}{ ^}cæ‡ÁY ^∥	GG	FFÐFÎÐG€FÌ	Ϋ́
ÌHJFÎI	Î	TÞÚÔŒ	GG}åÁ0Eç∧ĚÂÙÒ	Tậ}}^æ}[ ã	Ò}çã[}{ ^}cæ‡ÁY ^∥	ÍJ	FF∰FIED€€FÌ	Ϋ́
ÌIIÎJÍ	î	WÙÁŒE{ ^ÁÒ}ãç¦[}{ ^}cæ¢Á Ô[{ { æỳå	IÏÎFÁRæ{ ã}^Á0Eç^}≚^Áp	ŒLå^}ÁP?ã∥∙	Ò}çã[}{ ^}œ‡Á∕ ^		J₽HEBG€FJ	Ÿ
<u>Ì I Í Ï Ï Ì</u>	Î	ÔÚÁÜæäi[æå	HI€ÁGÏo@ÁOE;^ÈÄ⊳Ò	Tã}}^æ}[ ã	T[}ãt[¦ã]*/3000004	FI€	JÐFÎÐĐ€FJ	Ϋ́

#### HUV`Y`9!' KY`g`8]gWcgYX'h\fci[\`DfcdYfhmHfUbgZ/f :M&\$%`5bbiU`FYdcfh Hk]b'7]h]Yg`5fam5aaib]h]cbg`D`Ubh 5fXYb`<]``gžA]bbYgcHJ



l b]ei Y`Bi a VYf	7 UhY[cfm	@UghBUaYcf`6ig]bYgg`BUaY	GlfYYh	7 ]hn	GłUłi g	8 UhY <sup>*</sup> 7 ca d`YhYX	8 Ydh	8 UHY 8 f]`YX
FEEEGH JF	Ιæ	Ú¦^&ææi[	GFGÎÁLÍc@Á0Gç∧ÊÄÞÒ	Ô[ ĭ{àãæ#R^ãt@e	Qæ£cãç^	FGÐĴ£D9€FÌ		Ϋ́
P€€€€FGÏ FG	Ϊà	Õ^}å[ÁÚ¦[]^¦œ?•ÁŠŠÔ	GFJÏÁRæååðj*q[}ÁÜåÈ	Ü[ ∙^çã ^	Ù^æ†^å/₩₩₩₩₩₩	IÐFJÐG€FJ		Ϋ́
P€€€FGHH€Î	Ϊà	Ræ	FJÌIÁQEč{}ÁÚdÈ	Øæ¢&[}Á₽^ã®ø	Ù^æ†^å/₩₩₩₩₩₩	JÐÐЀFJ		Ϋ́
P€€€HGGIÎÎ	Ϊà	Př[c	FJHHÁGÎc@ÁOEç∧ĚÁ⊳Y	Þ^,ÁÓ¦ãt@q[}	Ù^æ†^å/₩₩₩₩₩₩	Í£C9€EC9€FJ		Ϋ́
P€€€HGÍGÍÏ	Ϊà	Šājå∙d[{	FÏFJÁTaa} ∕ÁŜ}È	Ü[ ∙^çã ^	Ù^æ†^å/₩₩₩₩₩₩	HBGÍÐB€FJ		Ϋ́
P€€€HGÍIÎÎ	Ϊà	Př[c	FJHHÁGÎc@ÁOEç∧ĚÁ⊳Y	Þ^,ÁÓ¦ãt@q[}	Ù^æ†^å/₩₩₩₩₩₩	Í£C9€EC9€FJ		Ϋ́
P€€€HŒÍIJJ	Ϊà	Tậ}}^•[cæớÔ[}-^¦^}&^ÁŒ•[&ãæcā[}Á[-Á Ù^ç^}c@ÄÖæêÁOEâç^}cãro	Í€HÁTã•ã•ã]ãÛdŽÞÒ	Ø1ãã ^^	Ù^æţ^å <i>‱‱</i>	HBGÍÐB€FJ		Ÿ
P€€€HÖİGHH	Ϊà	S^}}^å^	JÎÁTããÁJæà∙ÁŠ}È	Ü[ ∙^çã ^	Ù^æ†^å/₩₩₩₩₩₩	GÐÌÐG€FJ		Ϋ́
P€€€HGÌFHH	Ϊà	Ôæ •[ }	̀΀ÁÛãç∧¦ÁŠæà∧ÁÜåÈ	T[ĭ}å∙ÁçãA,	Ù^æ†^å/₩₩₩₩₩₩	F€BGJBD€EFÌ		Ϋ́
P€€€HÏGII	Ϊà	Úląį l^	HGIIÁÜæ)å^^}ÁÜåÈ	O⊞å^}ÁPã∥∙	Ù^æ†^å/₩₩₩₩₩₩	J₽FJEQ€EFJ		Ϋ́
WÞS€ÍÎGJÏÎ	Ϊà	R ∣ã •	IFHÏÁRæ{ ^∙ÁÔã& ^	O⊞å^}ÁPā∦●	Ù^æ†^å/₩₩₩₩₩₩	FFÐFHBD€€FÌ		Ϋ́

#### HUV`Y`9!( GYU`YX`K Y``g : M&\$% `5 bbi U`FYdcfh Hk ]b`7 ]f]Yg`5fa m5a a i b]f]cbg`D`Ubh 5fXYb`<]``gžA]bbYgcHJ



I b]ei Y Bi a VYf	7UhY[cfm	@UghiBUa Y`cf`6 i g]bYgg`BUa Y	GlfYYh	7 ]lm	l gY	8 UHY GYU YX
IHJ€I	Ϊæ	Ôãc Á, -Á05; å[ç^¦	FÍGFFÁÞðt@cðj*æ†^ÁÙdÉÁÞY	OBjå[ç^¦	Yæe^¦ÁÙĭ]] ^Á₩₩	∖IÐFÍÐGÆFJ
ÍÍÏÎÏ€	Ϊæ	Ùcæ),ÁS[&@Áæ),åÁÙ[}●Á/¦˘&∖āj,*	Sæ•[œaÁ0kç^ÈBPYŸÁGÌ€ÁÞY	Ù dĂÚ æč	ΥΤÒΥ	JÐFÎÐG€FJ
ÍÍÏĨF	Ϊæ	Ùcæ),ÁS[&@Áæ),åÁÙ[}●Á/¦˘&∖ậj*	Sæ•[œaÁ0Eç^ÈBPYŸÁGÌ€ÁÞY	ÙdĂÚæi	ΥΤÒΥ	JÐFÎÐG€FJ
ÏÌ€ÌÌÏ	Ϊæ	ΤϷΆ̈̈́ŮV	FI€€ÃÕ^¦çæãrÁOEç^	Tæ] ^,[[å	ΥΤÒΥ	I £9339€FJ
Ì GFI FÏ	Ϊæ	V@Axalat^	GÍ€FÆS[,¦^ÁOEç^ÈA⊳Ò	ÙdĐĂOE;c@{}^	ΥΤÒΥ	ÎÐFHBO3€FJ
Ì GÌ FGÌ	Ϊæ	V@ÁXå æ*^	GÍ€FÃS[,¦^ÁOGç^ÈA⊳Ò	ÙdĂ05;c@2}^	ΥΤÒΥ	ÎÐFHBO3€FJ
Ì GÌ FH€	Ϊæ	V@Axajae*^	GÍ€FÁS[,¦^ÁOEç^ÈA⊳Ò	ÙdĚ405;c@{}^	ΥΤÒΥ	ÎÐFHBO3€FJ
ÌGÌFHF	Ϊæ	V@Axajae*^	GÍ€FÁS[,¦^ÁOEç^ÈA⊳Ò	ÙdĚ405;c@{}^	ΥΤÒΥ	ÎÐFHBO3€FJ
ÌGÌFHG	Ϊæ	V@Axalat^	GÍ€GÁŜ[,¦^ÁŒç∧ÈÃ⊳Ò	ÙdĐĂOE;c@{}^	ΥΤÒΥ	ÎÐFHBO3€FJ
P€€€€H€€ÏIF	Ϊæ	Ö[¦∙[ÁÓĭ ậå ậ, * ÁÔ[È	GÌFIÁÔ ^ç^ æ)åÁ0Eç^} `^Á₽	Ü[ ∙^çã∥^	ΥΤÒΥ	F€BBBB€FÌ
P€€€HGİIJÏ	Ϊæ	W}ãz^åÁÚ¦[]^¦cã∿∙ÁÖ^çÈÉŠŠÔ	GÍFÍÁN}ãç^¦∙ãĉÁOĘ∧ÈÂÙÒ	Tậ}}^æ}[ ã	ΥΤÒΥ	F€DE0€FÌ
P€€€HGÌIJJ	Ϊæ	U},æ¦åÁQç^∙ơ\¦∙	G΀€ÁY∄j¢∖¦ÂÙdĂA⊳Ò	Tậ}}^æ}[ ã	ΥΤÒΥ	IÐFJÐG€FJ
P€€€€HÌIJJ	Ϊæ	Tæ¦^^	FÏÍÍÁ/æcĭ{ÁÛdÈ	Øæ¢&[}Á₽^ã@o•	Yæe^¦ÂÛĭ]] ^Â₩₩	∖FFÐFÍÐGÆFÌ
P€€€HHÍÌÌ	Ϊæ	Þ[¦œÛœ	FÌFHÁRæs&\•[}ÁÛdĎÁÞÒ	Tậ}}^æ}[ ã	ΥΤÒΥ	FFBGJBG€FÌ
P€€€H JÏ JF	Ϊæ	V^¦¦æ&[}ÁÔ[}•ĭ æa);orÁ00;ÔÈ	IÏÍÁU∣åÁPãt@, æੰÁÌÁ⊳Y	Þ^,ÁÓ¦ãt@q[}	ΥΤÒΥ	ÎECÄEDS€FJ
P€€€HIJJII	Ϊæ	Ü[•^çậ ^ÁÚ¦[]^¦c*ÁTæ);æ*^{^}ơÔ[È	GÏG€ÁØæáiçã∿,ÁO£ç^È	Ü[ ∙^çã ^	ΥΤÒΥ	F€BFGED€EFÌ
P€€€ĤÍÎJÍ	Ϊæ	U¦co@(aa)	FÏ€ÏÂÙ@^^¦ÁŒç^ÈĂY	Ü[ ∙^çã ^	Yæe^¦ÂÛĭ]] ^Â₩₩	∖ì <del>bh</del> ebbe∈Fj
P€€€Ĥ΀ÌI	Ϊæ	Úæ∖Áܦ[]^¦æ≹∙	GHGİÁY^&∣ã-ÁÙdÈ	Úd <b>Á</b> Úæľ	Uc@¦AMMMM	ÁÍÐHFBD€FJ
P€€€ĤÎFG	Ϊæ	Úæ\ÁÚ¦[]^¦æ\•	GHGÏÁY^&∣ã-ÁÛdÈ	Ù dĂÚ æč	Uc@¦////////////////////////////////////	ÁFÐFGEЀFJ
P€€€€ĤÎÍIH	Ϊæ	S°∙&&	FÎIGÂS[ãrÁÖ¦ãç∧	Ù@Į¦^çã∖	Yæe^¦ÂÙĭ]] ^Â₩₩	∖GĐ∓HBO€EFJ
P€€€€ĤÎÎIF	Ϊæ	X[*^ ÂÛ@^^oAT^œe	ĠìH€ÁØæáiçã∿,ÁO£ç∧ĚÁÞ	Ü[ ∙^çã ^	ΥΤÒΥ	F€DHBCFÌ
P€€€ĤÏĠÏ	Ϊæ	Ôãĉ Áį -ÁQ1ãa  ^^ ÁPÜCE	Î I HFÁW}ãç∧¦∙ãĉ ÁŒç∧ ÈÃ⊃Ò	ئãå ^^	ΥΤÒΥ	F€BCÍED€EFÌ
P€€€€HÍÏÍ€Ì	Ϊæ	©ÜÖÂLGFÉAT[`}å∙ÁX&?`,ÁŰ`à &&ÁÛ&@?[ •	G€Ï€ÁÔ[ĭ}ĉÁÜåÈÄ₽ÁY	Þ^,ÁÓ¦ãt@q[}	ΥΤÒΥ	IECHEC€FJ
P€€€€ĤÏÍFÍ	Ϊæ	Ôãĉ Áį, Á¤^, ÁÓ¦ã @g[}	Ϊ€FÁÒOÕPVPÁOEç^}`^Á⊳Y	Þ^,ÁÓ¦ãt@q[}	ΥΤÒΥ	ÍÐHBO€€FJ
P€€€€HÍÏÍFÎ	Ϊæ	Ôãĉ Áį, Á¤^, ÁÓ¦ã @g[}	Ï€€ÁØØØVPÁÙdĂÞY	Þ^,ÁÓ¦ãt@q[}	ΥΤÒΥ	ÍÐFED€EFJ
P€€€€ĤÎÍGJ	Ϊæ	Ü[•^çã∥^ÁQ;ç^∙q{^}ơÂÚæid;^¦•ÁŠŠÔ	FÏFÏÁÔ[`}ĉÁÜåÁÔÁY	Ü[∙^çã ^	ΥΤÒΥ	I <del>Di</del> EDEFJ
P€€€€ĤÏÍÌÏ	Ϊæ	©ÜÔÂĴąţ^¦AŠæ\^ÁXą∥æ*^AŠŠÔ	HÌ€€ÂÙậç∧¦ÁŠæà∧ÁÜå	ÙdÈĂOE;c@2;}^		ÍÐGJÐG€FJ
P€€€ҢÍÏJHÎ	Ϊæ	Þ[ ¦l* Čæå	FÌÏÍÁÕ ^}]æĭ ÁŒç^È	O⊞å^}ÁPã∥∙	Yæe^¦ÂÛĭ]] ^Â₩₩	∖FFÐFIÐGÆFÌ
P€€€ĤÌFÎÍ	Ϊæ	Yæ•	G€€ÁY@^ ^¦ÁÙdĚA₽	Ü[∙^çã ^	Yæe^¦ÂÛĭ]] ^Â₩₩	∖FFÐFÍÐGÆFÌ
P€€€ĤÌÌG	Ϊæ	Óæ¢åÁÒæt  ^ÁÓĭ ā¦å^¦∙	GGHÏÁ⇔ÁÔ ^ç^ æ)åÁ0Eç^È	Ü[ ∙^çã ^	Yæe^¦ÂÛĭ]] ^Â₩₩	ÁFFÐFIÐGÆFÌ
P€€€HÍJGÍÍ	Ϊæ	Ùơ∿~^}•	GFIHÎÁX[ *æÂÙdĂ₽Ò	Šą),[[å	Yæe^¦ÂÛĭ]] ^Â₩₩	∖F€DHBC€FÌ
P€€€HÍ JCÍ J	Ϊæ	Ô æੱ•[ }	ÎÌÍÁJc@Á0Gç∧ĚÁÞÒ	Ô[ ǐ{àãæÁP^ãt@or	Yæe^¦ÂÛĭ]] ^Â₩₩	ÁF€BCÍE©€€FÌ
P€€€Ĥ JHÌÎ	Ϊæ	Ôãc Á, Á¤^, ÁO¦ã @a;}	FGGÍÁU∣åÁPãt@, æੰÅiÁ⊳Y	Þ^,ÁÓ¦ãt@q[}	Y T ÒY	F€BFÍ£D3€EFÌ
P€€€Ĥ JHÌÏ	Ϊæ	Ôãc Á, Á¤^, ÁO¦ã @a; }	FGGÍÁU∣åÁPãt@, æੰÅiÁ⇔Y	Þ^,ÁÓ¦ãt@d[}	ΥΤÒΥ	F€BFÍ£D3€EFÌ
P€€€Ĥ JHÌÌ	Ϊæ	Ôãc Á; Á¤^, ÁÓ¦ã @q;}	FIFÁFIc@ÁÙdĚA>Y	Þ^,ÁÓ¦ãt@a[}	Y T ÒY	F€BFÍ£D6€FÌ
P€€€HÍ JHÌ J	Ϊæ	Ôãc Á, Á¤^, ÁO¦ã @a;}	FIFÁFIc@ÁÚdŽAPY	Þ^,ÁÓ¦ãt@q[}	Y T ÒY	F€BFÍ£D3€EFÌ
P€€€Ĥ JHJ€	Ϊæ	Ôãc Á, Á⊳^, ÁÓ¦ã @q[}	FIFÁFIc@ÁÙdĚAPY	Þ^,ÁÓ¦ãt@e[}	ΥΤÒΥ	F€BFÍ£D€EFÌ
P€€€Ĥ JHJF	Ϊæ	Ôãc Á; Á¤^, ÁO¦ã @q; }	FIFÁFIc@ÂÙdĚAPY	Þ^,ÁÓ¦ãt@a[}	ΥΤÒΥ	F€BFÍ£D3€EFÌ
P€€€ĤÍJÍJÎ	Ϊæ	TÞÚÔŒ	GF€€ÁÒÁ₽^}}^]ậ,ÁQ5ç^È	Tậ}}^æ}[ ã	ΥΤÒΥ	F€BEB€FÌ
P€€€HÍ JJFF	Ϊæ	TÞÖUVÁÕ^[c^&@;ã&æþÁÒ}*ā;^^¦ā;*	Ü[ ∙^çã ^	Ü[ ∙^çã ^	ΥΤÒΥ	FGBFFBG€FÌ
P€€€Ĥ JJJI	Ϊæ	TÞÖUVÆÕ^[c^&@;a&adAÔ}*ā;^^¦ā;*	T[`}å•ÁXã^	T[ĭ}å∙ÁXã∿	ΥΤÒΥ	FGÐÛÐBG€FÌ

#### HUV`Y`9!( GYU`YX`K Y``g : M&\$% `5 bbi U`FYdcfh Hk ]b`7 ]f]Yg`5fa m5a a i b]f]cbg`D`Ubh 5fXYb`<]``gžA]bbYgcHJ



I b]ei Y Bi a VYf	7UhY[cfm	@UghiBUaYcfi6ig]bYggiBUaY	GlfYYh	7 ]hm	l gY	8 UHY GYU YX
P€€€H JJJI	Ϊæ	TÞÖUV/Ã^[&^&@);3&2a4/ÁO}*āj^^¦āj*	Ü[ ∙^çậ ^	Ü[ ∙^çã ^	ΥΤΟΥ	FGBFÏED€€FÌ
P€€€́HÍ JJJÎ	Ϊæ	TÞÖUVÁÕ^[&^&@;&&æ‡ÁÒ}*ā;^^¦ā;*	Ü[ ∙^çã ^	Ü[ ∙^çã ^	Y T ÒY	FGBFHBQFÌ
P€€€ĤÍ€IÌÎ	Ϊæ	V^¦¦æ&[}ÁÔ[}•ĭ œa)o•	GGÌÌÁÔ[ĭ}∂ĈÁÜåÈÃÔ	Ü[ ∙^çã ^	Y T ÒY	F€DHD€FÌ
P€€€Ĥ €I JG	Ϊæ	V^¦¦æ&[}ÁÔ[}●ઁ œe)œ	Fl€€ÁlHåÁOEç^ÈÁ⊳Ò	ئãã ^^	ΥΤÒΥ	F€BHEBG€FÌ
P€€€Ĥ €Í €€	Ϊæ	V^¦¦æ&[}ÁÔ[}•č œa)•	GIÌFÁÔ[{[ÁOEç^È	Ù dĂÚ æ'	Y T ÒY	FGÐÍÐS€FÌ
P€€€Ĥ €Í FG	Ϊæ	V^¦¦æ&[}ÁÔ[}•ĭ œa)o•	FÍÎÍÁ&0ÜÙVÁQEç∧ÈÁ⊳Y	Þ^,ÁÓ¦ãt@q[}	Y T ÒY	GBFÌEDS€FJ
P€€€Ĥ́€Ï€I	Ϊæ	Ø^æðj *	HFFHÁØænäçã∿,ÁØuç∧ÈÁ⊳	Ü[ ∙^çã ^	ΥΤÒΥ	F€BCÍED€EFÌ
P€€€Ĥ€Ï€Ï	Ϊæ	Öæà[cæÁ₽^¦ãæð*^ÁÚ¦[]^¦cã∿•Á0⊉Ô	HFÍÁ2020∨PÁCEç∧ÈAÞY	Þ^,ÁÓ¦ãt@q[}	Y T ÒY	F€BHEBD€FÌ
P€€€Ĥ FG€Î	Ϊæ	Ræç^ ậ, ÁÕ¦[ĭ]	GGÌÍÁPæ{]å^}ÁDĒç^}č∧ÁY	Ù dĂÚ æ'	Y T ÒY	F€BFÏED€EFÌ
P€€€Ĥ FGHÌ	Ϊæ	Ôæ) ãæ)ÁÚæic)^¦•ÊÔÐUÁ¤[çæÁÔ[}•` cã)*	ÏHÌÁXæ)忢ãæÁÛdÈ	ÚdĚĺúæ	ΥΤÒΥ	F <del>BCHBC€</del> FJ
P€€€Ĥ FGHJ	Ϊæ	Ôæ) ãæ)ÁÚæic)^¦•ÊÔÐUÁ¤[çæÁÔ[}•` cã)*	ÏÏÏÁXæ)å∣ãæÁÛdÈ	ÚdĚĺúæ	ΥΤÒΥ	FEGIEDS€FJ
P€€€Ĥ FG €	Ϊæ	Ôæ] ãæ‡ÁÚæic) ^¦•ÊÔÐUÁ¤[çæÁÔ[}•ĭ cã; *	Ì€ÏÁPæ{]å^}ÁOEç^ÈÄÞ	Ú Ú ÉÁÚ æč	Y T ÒY	F£QF£Q€FJ
P€€€Ĥ FG Í	Ϊæ	Ôæ] ãæ‡ÁÚæic) ^¦•ÊÔÐUÁ¤[çæ4Ô[}•` cã; *	∣ïÍÎÁXæ)忢ãæAÛdÈ	Ù dĂÚ æ'	Y T ÒY	FEGIEDS€FJ
P€€€Ĥ FG Î	Ϊæ	Ôæ] ãæ‡ÁÚæic)^¦•ÊÔÐUÁ¤[çæ4Ô[}•` cã;*	ÏG€ÁXæ)å∥ãæÁÛdÈ	Ù dĐấ Ú ač	ΥΤÒΥ	F <del>EQHEQ€</del> FJ
P <b>€€€HÎ</b> FÌ FI	Ϊæ	Õ^¦æ\$ã	FÌ€ÍÁŠ[}*ÁŠæà^ÁÜåÈ	Þ^,ÁÓ¦ãt@a[}	ΥΤÒΥ	F€BCIED€EFÌ
P€€€Ĥ G H	Ϊæ	Uå^*ælå	G΀ÍÁY@^ ^¦ÂÙd∄A	Ü[∙^çã ^	Yæe^¦ÂÛĭ]] ^Â₩₩	∖FÐFÌÐG€EFJ
P€€€Ĥ́GHÍ	Ϊæ	Ô¦ a&∖ •[}	ĠÍÍJÁQĘåãj∧ÁÛdÈ	Ü[∙^çã ^	Yæe^¦ÂÛĭ]] ^Â₩₩	∖FÐFÍÐG€FJ
P€€€Ĥ́GIĨ	Ϊæ	Ù&@æ^¦	Fl €€ÁŠ[}*ÁŠæà^ÁŰåÈ	Þ^,ÁÓ¦ãt@d[}	Yæe^¦ÂÛĭ]] ^Â₩₩	∖ÎÐFFBG€FJ
P€€€Ĥ́GIÌ	Ϊæ	Tæ),^ÁŜŠÔ	HGIIÂÛæ);å^^}ÂŰåÈ	O⊞å^}ÁPã∥∙	Yæe^¦ÂÛĭ]] ^Â₩₩	∖ÎÐGÎÐG€FJ
P€€€Ĥ G JI	Ϊæ	TÞÖUV	Þ^, ÁÔ;ã*@2[}	Þ^,ÁÓ¦ãt@d[}	Y T ÒY	IEBGEB€FJ
P€€€ĤÍĠÍJĨ	Ϊæ	TÞÖUV	OEtå^}ÁP?ä∥∙	OEtå^}ÁPã∥∙	Y T ÒY	IEDGED€FJ
P€€€ĤÍĠÍJĨ	Ϊæ	TÞÖUV	OEtå^}ÁP?ä∥∙	OEtå^}ÁPã∥∙	Y T ÒY	IEDGED€FJ
P€€€Ĥ G JÌ	Ϊæ	TÞÖUV	Ù@¦^çâ∖	Ù@Į¦∧çã\	Y T ÒY	I £93689€FJ
P€€€ĤĜĴĴ	Ϊæ	QÜÖÂLGFÉAT[`}å•ÁXâ*,ÁÚ&@2[ ÁÖãada&c	FÏÏ€ÁY ÁÔ[`} ĉÁÜåÈÁGÂÒ	OEtå^}ÁP?ã∥∙	Y T ÒY	ÍÐHЀFJ
P€€€Ĥ Ĝ JJ	Ϊæ	©ÜÖÂIGFÉAT[`}å∙ÁXâ°,ÁÛ&@?[ ÁÖãrda&c	ÍÍÆ€ÁÛ≚∄j&ÂÚÈ	∣    T [ ັ}å∙ÁXā^,	ΥΤÒΥ	ÍÐH£Ð€€FJ
P€€€Ĥ Ĝ H€	Ϊæ	OEa¦æ@æ{ÁÚ¦[]^¦cã∿•	ÌFÏÁOEç∧ÊÄ⊳Ò	Tậ}}^æ}[ ã	ΥΤÒΥ	F€Ð169€FÌ



DUN. N. P. =CD/c \*\*WigR59 BJ 14755 DS51XYbS<] "GSA B7AL8 R8\$% 1\$%P.∏ if YS91% 6K Y" ≐bj Yb+cfmiGhiXm5fYU6: M8\$%, "a IX 8 Uh¥. %# \$#85% H]a Y.-.)(.'+5A IgYf.\_[dYh¥fg



bount. N.P. =cOfc.~WW1gK59 BJ 1417 5 5 DS5 fXYDs-;]`gSA BFALL8 RASASI\$%P.∏.ifYS9!&S5 fYUg`cZ7 cb W1fb`fibjh``UbX`Ibjh(L5:M8\$% 'a:IX 8 UHY. %#K\*#S54S Hja Y.&.'(.\$(`DA IgYf.`\_dYhnfg



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V, āj ÁÔãa?•ÁŒ{ ^ÁŒ{ { `}}ããā[}•ÁÚ|æ);c Ό^} Á?ā]•ÉATāj}^•[cæ





# **APPENDIX F**

**Annual Site Inspection Checklist for Land Use Controls** 



#### ANNUAL SITE INSPECTION CHECKLIST FOR LAND USE CONTROLS

#### Operable Unit 2, New Brighton/Arden Hills Superfund Site

Date: \_6/19/2019

Linda Albrecht, Robert Reine, Mary Lee, Desiree Taylor, Inspected by: Hoa Voscott,

Period Covered: From prior annual inspection (7/30/2018) to above date

	BLANKET LUCs OTHER LUC AREAS				OTHER LUC AREAS	SITES WITH ADDITIONAL LUCS FOR SOIL COVERS						
					Area w/Restricted Commercial Use	с	D	E	G	н	129-15	Outdoor Firing Range
Property owner:	BRAC	N.G.	Reserve	R.C.	N.G.	BRAC	N.G.	N.G.	N.G.	N.G.	N.G.	N.G.
Soil LUCs		5 6 38	12.00		19月1日日本							
Are there any land uses that result in a non-compliant exposure versus the exposure assumptions described in the LUCRD?	No	No	No	No	No	(Soil LUCs are covered under the Blanket LUCs)				1		
Soil Cover LUCs												
Has there been any excavation activity or any other man-made soil disturbance at the site?	N/A	Yes	N/A	N/A	N/A	No	No	No	No	No	No	Yes
Are there any areas of the soil cover that have inadequate vegetative cover?	N/A	N/A	N/A	N/A	N/A	No	No	No	No	No	No	No
Has there been any damage to run-on/runoff controls (swales, berms, riprap, etc.)?	N/A	N/A	N/A	N/A	N/A	No	No	No	No	No	No	No
Has there been any damage to or removal of the signs marking the edge of the soil cover?	N/A	N/A	N/A	N/A	N/A	No	No	No	No	No	No	No
If the soil cover has a permeability requirement, is there any woody vegetation present that exceeds 2-inch diameter?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A	N/A	N/A
Has there been any damage to or removal of the concrete slab that serves as a protective cover?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Groundwater LUCs					Section Section				0.00			
Have any wells been installed that withdraw water from a contaminated aguifer, without MDH/MPCA/USEPA approval?	No	No	No	No		Groundwate		a covered i	under the Bl	anket LUC	s)	
Has there been any damage to or interference with any groundwater remedy infrastructure (wells, piping, treatment systems, etc.)?	No	No	No	No		oroundwate	1 2003 an					
BRAC = Base Realignment and Closure Division N.G. = MN A Based on the annual site inspection, the undersigned hereby certifies t Alternatively, any known deficiencies and completed or planned action	N.G. Blan Outdoor I hat the abc	Comm nal Guard/ ket LUCs Firing Rai	ents (Attach National Gua - Excavatio nge LUC - Es I property ow ficiencies are	additional ard Bureau n, there w xcavation <u>Certificatii</u> mers and e describe	pages as necessary): Reserve = U.S. / was excavation at the con h, there was excavation as <u>on:</u> above-described land use of d in the attached Explanation	Army Reser struction s s part of th controls hav	ve site, NEPA e construct ve been co ency(ies).	R.C. = Ra was comp ction of the mplied with	amsey Cour oleted a division h	nty neadquarte riod noted.	er building	
- Jost												
Hoa Voscott, Arcadis US Inc.					Description of Deficiency	(ies) attach	ed?	x Yes, al	oove	🗆 No (no	one were id	entified)

# **APPENDIX G**

Groundwater Monitoring Report - May 2019 Sampling Event Rice Creek Remeander Project, Bay West, 2019<sup>-</sup>





R″∣^ÁFÍÉAG€FJÁ

OtĘ ^ÁPænáaæiaaeáa Á Tāj}^•[cæaÁÚ[l|ĭcā[}ÁÔ[}d[|ÁOE\*^}&^Á ÍG€ÁŠæææi^oco^AÜ[æaåÁ¤[¦c@Á ÙæaājoÁÚæĕ|ÉATāj}^•[cæaÃiÍFÍÍÁ æç[^È@enáaæeáa:O]&æaè=cææ∿bÈ}}È•Á

Ü^KÁÁ Õ¦[`}å, æe^¦ÁT[}ãt[¦ā]\*ÁÜ^][¦dEATæÂÓGEFJÁÙæ{]|ā]\*ÁÒç^}ơÁ Ü3&^ÁÔ¦^^\ÁÜ\^{ ^æ)å^¦ÁÚ![b/8ơÁ V,ā]ÁÔãa®t•ÁŒ{{ ^ÁŒ{ {`}ãta]}ÁÚ!@a)ơÄÜ^å^ç^|[]{ ^}ơÁ T ÚÔŒAÛã~Á©BKÁKÚGCEÌJGEDIÓIÎÌÏÁ ÓæÂY ^•ơÁÚ![b/8ơÁ¤[ÈARFHEFIÏÁ

Ö^æłÁQĘ, îKÁ

$$\begin{split} & (\hat{A}) = \hat{A} +$$

- Óæ ÁY ^• œ ÁV^&@ a&æ‡ÁT ^{ [ ¦æ) å` { Á^} œ †^å Á%úl[] [•^å ÁÕ ¦[ ` } å, æ ɛ^! ÁT [ } ãt ¦ā) \* ÁÚlæ) L
  Ó`ājåāj \* ÁF€GÁÔ@[ ¦āj æ ɛ^å ÁXUÔÁÚ|ǐ { ^+HŽåæ ɛ ² å ÁÙ^] c^{ à ^! ÁFÎ ÉG€FÍ ÉAæ Áæ] ] ¦[ ç^å Áàˆ Ác@ T ÚÔCHÁ§ Áæ) Á{ æ ãfÁšæ ɛ ² å ÁU&ţ à ^! Á ÉG€FÍ LÁæ) å
- V@ÁÞ[ÁŒ•[&ãæaā] > ÁÖ^c^{ { ā æaā] > ÁÇÞOEÖDÁã ` ^åÁà^ Ác@ÁTā] > ^•[ æaÁÚ[ || ` cā] > ÁÔ[ > d[ | OE ^ } & ÁŢ ÚÔOEDÁ[ ¦Á@ÁÜã& ÁÔ | ^^\ Á^{ ^aà å^ ¦Á| [ b^&c/ásæc^åÁÖ^&^{ à^ ¦ÁHEEAGEFÍ È

V@•^Áå[&`{ ^} œ Á` dā] ^åÁs@ Á;![][•^åÁ ^||Á[&ææā] }•Áse) åÁ';[`}å, æe^;!Á;|^çææā] } Á;[}ãt[;]ät[;]ät[;]ät[;]ä •æ{]]ā] \*Á;<sup>^</sup> ^}&` Á[Á^•cæa) [ä @Áaæ•^]ā] ^Á\*;[`}å, æe?;!Á8[}åãuā] >•Á];]ä[!Át] Áć@Á'^{{ ^ae}} åÁ; ];[çãã^AÁ[;!Á8[}cā] `^åÁ\*;![`}å, æe?;!Á{[}ãt[;]ä \*Á][•dĦ^{{ ^ae}} å^;!É¥/@Á\*æ{]]]ā] \*Áå^•&;!äa^åÅjÁc@ä Á ;^][;cáa^A{[;A8[};cā] `^åÁ\*;![`}å, æe?;!Á`; æbaĉ Áæ) åÁ?;[°cæaā]} •Áa^c, ^^}Ac@Á&@[;]ä] æe?åÁç[]ææā?ÅÅjÁc@ä Á ;^][;cáa[&`{ ^} œ Á\*;![`}å, æe?;!Á`; æbaĉ Áæ) åÁ?;[°cæaā]} •Áa^c, ^^}Ac@Á&@[;]ä] æe?åÁç[]ææā?Áf;[\*æ] ã&Á &[{ ][`}}åÁQXUÔDA];]`{ ^A[;]ä] ææā] \*Á;[{ Át[;{ ^!AC`ā}aā] \*ÁF€GÁæ] åÁc@Á^{{ ^ae}} å^;]Á; ÁÜã&AÁC;^^ A ,^•oA; Ás@ÁČ`ājaā] \*ÁF€GÁXUÔÁ';[`}å, æe?;!Á,[`{ ^EA

:][ifY`%/æccæ&@åÊAqiĭ•dæe^•Ác@ÁÙãe^Áæ)åÁqi&|ĭå^•Ác@Á{[}ãq[¦āj\*Á, ^||Á|[&ææqi]}•É4c@Áqi,~^¦¦^åÁ ^¢ce}oÁ[~Ác@ÁÓĭqåaj\*ÁF€GÁXUÔÁ&[}cæq(qi)æq(qi)æq(qi)æa/áÅ]/ĭ{^Ác@Áæqai}}{^Ac@Ááqai}{ !^{{^æ}}å^¦È4Ô[}•dĭ&cqi]}Á(~Ás@Á^{{^æ}}å^¦Á;æa Á&[{]|^ce\*åÁgiÁ\*æ}|^ÁTæîÁG€EFÎÁæ)åÁÜ&&^ÁÔ¦^^\Á;æa Á !^{[ĭe\*åák@[ĭ\*@ás@Á^{{^æ}}à^¦Á;}ÁAT}^ÁO`É4G€EFĨÈÁ

V@āÁ(^oc^¦Á^][¦ơÁ]¦^•^}orÁæá+`{ { 榈Á[,~Áæ]¦åÁæ);åÁ+æ; ]|ā]\*Áæ&aãçãa2ð•Áo@[`\*@ÁTæੰÁGJÉÆG€FJÁæ);åÁ ā]&[`å^•Á&`{ `|ææãç^Á\*¦[`}å,ææ^¦Á+|^çææã[}Á[[}ãã[¦ā]\*Áæ);åÁ\*¦[`}å,ææ^¦Á`æ‡ãĉÁsiæææbÁ



#### %\$`; FCIB8K5H9F'9@9J5H=CB'ACB=HCF=B; `

Óæ ÁY ^•o ć@æ• Á&[||^&c^åÁ';[`}å, æc^¦Á'|^çæa‡i}&aææækækô@ Á ãc^Áj^¦a[å a&æa‡|^Á a] &^ÁÖ^&^{(a)}ÅGEFÍÁ bǐ•oÁj¦a[¦Á{[Á&[]}•d`&ca‡i}Áæ&açãa?a\*eÁæ•[&ãææ\*åÁjão@é@Á'^{ ^æ)å^¦Áj¦[b^&cHUV`Y`%Áj¦^•^}@ÁæÁ •`{ { æb^Áj~Åå^]c@Át[Ájæc\*¦Áåæææk&[||^&c^åÁs@[`\*@ÁTæ?ÁGJÉGEFJÉÁ

Ö`¦ā) \* Ác@ ÁT æ ÁGEFJÁ æ{ ] |ā) \* Árç^} dÉÓæ ÁY ^• c4&[ ||^&c/å åf'¦[`}å, ær\¦Á'|^çæaā] } Áåæææfæa Ác@ ÁF€Á ^ ||•Á•^å Áå Ás@ ÁOE{ ^ Át Át [}ãt | Ás@ ÁŎ ātå ā) \* ÁF€GÁKUÔÁ,|`{ ^ Áse Á ^ || Áse Ás@ Át ` ¦ ÁUæ{ •^ ÂÔ[`} ĉ Á ^ ||•ÈÃÕ¦[`}å, ær\¦Á^|^çæaā] • Á+[ { Ác@ Ác, [ Á•@æ4][, ÁUæ{ •^ ÂÔ[`} ĉ Á, ^ ||•Áæ) å Ác@ Á•@æ4][, Á Ó ātå ā) \* ÁF€GÁ, ^ ||•Á, ^ !^Á` •^ å Át Á\* ^ } as A\* ![`}å, ær\!Á'|^çæaā] } Á&[ } d` ' !•ÈÁV@ Á\* ![`}å, ær\!Á &[ } d` ' !•ÊÉå^] ā&c\* å Át } Á\* ][ i fY %Ê\* @, Áæ4} [ ¦cœë; [ ¦c@, ^• c\*\|^Á\* ![`}å, ær\!Á![`}å, ær\!Á Uā&^AÔ\^^\Á} à ^ !Ásed@ å ¦æ jã& A\* æð à ? oft - Áse] ] ![ cæi; ær\|^ ÆEEFGA^^ cf, ^ IA[[, Áåā ^ &cā] } Át[]`} å, ær\!Á[], Á åā^&cā] } Áæj å Á\* !æð à / i&e / áše / áse / á ãc@Á@a\* d[ i 38æ4/åæææ4/[ { Ás@ Áse^ æ4Ă

#### &"\$`; FCIB8K5H9FEI5@HMG5AD@B;`

V[Áå[&č{^}ớX`¦[`}å, æe^\¦Á`čæjāĉÁà^ç, ^^}Áœ?ÁÓčājåāj\*ÁF€GÁXUÔÁ]]č{^ÁæjååAœ?ÁÜ&3XAÔ¦^^\Á ¦^{^æjå^\ÁÓæ?ÁY^•oÁ@æeÁ&[{]|^c^åÁ}āj^Á\*¦[`}å, æe^\¦Á•æ{]]āj\*Á^ç^}o•LÁÖ^&^{{à^\AGEFIÊA Ræjčæ^ÂGEFIÊÆG];¦ājÁGEFIÊÆX`}^ÁGEFIÊÆU&{{à^\AGEFIÊATæk&@?GEFIÊÆØ^à\čæ^ÂGEFIÊÆæjåÁOE\*č•oÁ GEFIÊÆæjåÁTæÂGEFJÊÆA

V@Á,^||•Á,^\^Á,`\\*^åA,\`ā,\`ā,\`ā,\`á,\`Á, (Á; Á; æ; ]|ā)\*Á`•ā,\*Á;@A[, Á; A; A; ]|ā,\*Á, ^c@, å[|[\*^ÈÁÙcæàā,ãæaā,} Á ]ælæá, ^c^\•Á, ^\^Á&[||^&c^å,áæeÁ\*æ&@Å, ^||Á4; Á^}•`\^Ác@æeÁ^]\^}cæaā,^Áæč`ã^\Á, æe^\Á, æe Áà^ā,\*Á &[||^&c^å,Áæ}åÅ,[có4,cæ\*;}æ;c4, æe^\Á, ãc@a, Ác@,Á, ^||Á&æeā,\*ÉÁ

V@ Át¦[`}å, æc^¦Áræ{]|^•Á, ^¦^Á]|æ&^åÁ§iÁæà[¦æ{¦îË`]]|ð\åÁræ{]|^Á&[}œaj,^¦•Áæ}åÁr`à{ãc^åÁ q[ÁŠ^\*^}åÁ/^&@;3&æ‡ÁÙ^¦ç3&^•É4Q;&È4ÇŠ^\*^}åDÁ{¦Áæ}憰•ãrÁ[-ÁXUÔ•Áà^ÁÒÚŒ4(^c@[åÂ:G΀ÓÁ[[,Ë |^ç^|ÈÁ

7\Ya]WU <sup>™</sup>	; fcibXkUh¥f GHUbXUfX`fA8 <F@L<br f⊯[#@L	GifZJWY`KUHYf` GHJbXUFX` fl=[#@L	FF; '2cf'6i]`X]b['%\$& ;fcibXkUh¥f'D`iaY' fb±[#@⊈
V¦a&@[¦[^c@}}^Á	ÍÁ	GÁ	ÍÁ
À^{@oo^}}Å	Ï€Á	Þ[ơÂÔ∙cæà ãr@∘åÁ	Ï€Á
FÊFËÖ&&@{[¦[^c@}}^Á	ÎÁ	Þ[ơÂÔ∙cæà ãr@∿åÁ	ÎÁ
Xậi^ ÁÔ@q[¦ãã^Á	€ÈGÁ	€ÈÈÌÁ	€ÈÈÌÁ

#### 6 i ]`X]b[ <sup>·</sup>%\$&`F YWca a YbXYX`F Ya YX]Uf]cb<sup>-</sup>; cUg<sup>-</sup>

Á



Ő¦[`}å, æc^¦Áa)æf`ca&ædÁ^•`|o•Á{¦Ás@ÁTæÁOEFJÁæ{]|ð]\*Á?ç^}cÉð,¦^•^}cČð,¦Åa, ÅHUV`Y`&Éða,å&ææ\*åÁ c@Á]¦^•^}&^Á[-Á&ãa ËFÉDËåa&@[¦[^c@}^ÁæeÁæé&[}&^}cæða]}Á[-ÁFÈJÁ{a&¦[\*¦æ{•Á]^¦Áãa\*¦ÁQu\*EŠDÁæeÁ UFVÜÔFÖĚV@āÁ&[}&^}ca&æðA^][¦A\*A[[, Ás@ÁÜÜÕÁ[¦Ás@áA8[{][`}aÅ[A, €Áµ\*EŠÈÁDE&[]^Á[-Ás@Á |æà[¦æ{[¦^Áa)æf`ca&æðA^][¦A4[¦Ás@ÁTæÁOEFJÁæ{]]ð]\*Á?ç^}oÆiÁ&[}cæða^àÁ§JÁ5ddYbX]I.5EÁ

### ''\$`7CB7@G-CBG'5B8'F97CAA9B85H-CBG'

V@ÁTæÍAGEFJÁæ{]|ā)\*Á\ç^}dA^]¦^•^}œÁ@Á,ā)c@Áæ{]|ā)\*Á\ç^}dA^``ã^åÁ`}å^¦ÁœÁæ]]¦[ç^åÁ \*¦[`}å,æe^¦Á{[}ãī{¦ā)\*Á¦|æ)ÈÁ/@[`\*@Á@Á&[`¦•^Á;~Á@Á{[}3ã[¦ā)\*Áæ&aã;ãã?•Ê4}[}^Á;~Á@ÁÔUÔ•Á @æç^Áà^}Áå^c&&cåA5}Á@ÁÜæ{ •^^ÁÔ[`}c´Á,^||•Á\¢&^^åā)\*Á@ÁÜÜÕ•Á\•cæà|ã@åÁ6jÁ@ÁÜUÖÁ Ça{ ^}å{ ^}dÅIDÉÁ

Óæ•^åÁ[}Áo@Á}āj^Á\*æ{]|āj\*Á^ç^}o•Á&[}•ã\*c^}d^Á\*@{;āj\*Áo@Áæ\*^^Áæ}憰c^•Áà^|[,Áo@ÁÜÜÕ•ÉA Óæ`ÁY^•o4A^&[{{^}å•Á^å`&āj\*Ás@Á\*æ{]|āj\*Á'^``^}&`Á{{Az}}}`æ†É##A

QÁ[`Á@æç^Áæ)^Á`^∙aā)} •Á^\*ælåð) \*Ás@ði Áf∿ac∿¦Á^][¦dÉ),|^æ•^Á&[}aæ8oÁ( ^ÁæeÁQîÍFËHIFÈÁ Ùð),8∧¦^|ˆÉÁ

The W. VIII

Ü&& Áxæ) Á0∰^}ÊÁÚÕÁ Ù^}ã[¦ÁÚ¦[b%&cÁTæ)æ\*^¦BÕ^[|[\*ãrcÁ



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HUV`Yg'

# Table 1Groundwater ElevationsRice Creek Remeander

		Inner		
		Casing	Depth to	Groundwater
Well	Date	Elevation	Water	Elevation
	12/3/2015		6.27	881.49
	12/21/2015		6.81	880.95
	12/22/2015		6.71	881.05
	12/30/2015		7.52	880.24
	1/5/2016		7.23	880.53
	1/13/2016		7.73	880.03
	1/20/2016		8.52	870.24
	1/27/2016		8.50	870.17
	2/2/2016	-	10.55	073.17
	2/3/2010		10.57	077.19
	2/10/2010		10.75	871.01
	2/17/2016		16.36	871.4
	2/24/2016		dry	-
	3/2/2016		11.45	876.31
	3/9/2016		12.17	875.59
	3/16/2016		11.35	876.41
O1URC1S	3/23/2016	887.76	11.81	875.95
	3/30/2016		11.87	875.89
	4/7/2016		12.18	875.58
	4/22/2016		12.85	874.91
	4/27/2016		11.59	876.17
	5/5/2016		11 11	876.65
	5/25/2016		11.85	875.91
	6/6/2016		11.00	876.01
	7/9/2016		11.70	076.01
	0/05/0040		11.20	070.40
	8/25/2016		10.00	877.76
	10/4/2016		9.68	878.08
	2/7/2017		12.14	875.62
	3/14/2017		12.61	875.15
	2/13/2018		13.00	874.76
	8/13/2018		11.29	876.47
	5/29/2019		7.88	879.88
	12/3/2015		7.15	880.14
	12/21/2015		5.95	881.34
	12/22/2015		5.78	881.51
	12/30/2015		6.68	880.61
	1/5/2016		8.04	879.25
	1/13/2016		8.46	878.83
	1/20/2016		0.40	878.08
	1/27/2016		0.21	878.07
	2/2/2016		9.22	070.07
	2/3/2010		11.31	075.90
	2/10/2016		19.84	867.45
	2/17/2016		16.69	870.6
	2/24/2016		12.3	874.99
	3/2/2016		12.03	875.26
	3/9/2016		12.82	874.47
	3/16/2016		11.84	875.45
O1URC1D	3/23/2016	887.29	12.49	874.8
	3/30/2016		12.51	874.78
	4/7/2016		12.86	874.43
	4/22/2016		13.46	873.83
	4/27/2016		12.19	875.1
	5/5/2016		11.76	875.53
	5/25/2016		12.50	874.79
	6/6/2016		12 40	874 89
	7/8/2016		12.00	875.29
	8/25/2010		10.74	876 55
	10/4/2016		10.74	070.00
	2/7/2010		10.44	010.00
	2/1/2017		12.79	074.5
	3/14/2017		12.31	8/4.98
	2/13/2018		13.56	873.73
	8/13/2018		12.19	875.1
	5/29/2019		9.04	878.25

#### Table 1, continued

		Inner		
		Casing	Depth to	Groundwater
Well	Date	Elevation	Water	Elevation
	12/3/2015	Liovalion	4.50	883 14
	12/21/2015		4 61	883.03
	12/22/2015		4 42	883.22
	12/30/2015		5.21	882.43
	1/5/2016		5.86	881 78
	1/13/2016		6.24	881.40
	1/20/2016		6.91	880.73
	1/27/2016		6.93	880.71
	2/3/2016		7.21	880.43
	2/10/2016		7.21	870.74
	2/17/2016		8.69	878.05
	2/21/2016		8.95	878.69
	3/2/2016		8.66	878.08
	3/2/2010		8.00	970.90
	3/9/2010		0.49 7.50	079.15
0110000	3/10/2010	007.64	7.59	000.05
UTURC25	3/23/2016	887.04	7.18	880.46
	3/30/2016		6.98	880.66
	4/7/2016		7.11	880.53
	4/22/2016		7.61	880.03
	4/27/2016		7.17	880.47
	5/5/2016		6.83	880.81
	5/25/2016		6.87	880.77
	6/6/2016		7.20	880.44
	7/8/2016		7.22	880.42
	8/25/2016		6.40	881.24
	10/4/2016		6.11	881.53
	2/7/2017		8.71	878.93
	3/14/2017		7.62	880.02
	2/13/2018		10.92	876.72
	8/13/2018		7.41	880.23
	5/29/2019		2.73	884.91
	12/3/2015		31.62	856.11
	12/21/2015		16.59	871.14
	12/22/2015		16.31	871.42
	12/30/2015		15.46	872.27
	1/5/2016		5.27	882.46
	1/13/2016		16.69	871.04
	1/20/2016		14.95	872.78
	1/27/2016		10.82	876.91
	2/3/2016		10.57	877.16
	2/10/2016		11.02	876.71
1	2/17/2016		12.11	875.62
	2/24/2016		12.40	875.33
1	3/2/2016		12.30	875.43
	3/9/2016		12.13	875.60
1	3/16/2016		11.50	876.23
O1URC2D	3/23/2016	887.73	10.82	876.91
	3/30/2016		10.56	877.17
1	4/7/2016		10.61	877.12
	4/22/2016	1	11.24	876.49
	4/27/2016		10.99	876.74
	5/5/2016	1	10.88	876.85
	5/25/2016	1	10.99	876.74
	6/6/2016	1	11.11	876.62
	7/8/2016	1	11.42	876.31
	8/25/2016	1	11.50	876.23
	10/4/2016	1	11.07	876.66
1	2/7/2017		12.76	874 97
1	3/14/2017		12.48	875.25
	2/13/2018		12 50	875 23
1	8/13/2018	1	14 40	873.33
	5/29/2019		7.69	880.04

#### Table 1, continued

		Inner		
		Casing	Depth to	Groundwater
Well	Date	Elevation	Water	Elevation
	12/3/2015		4 03	888.57
	2/3/2016		5.20	887.40
	4/7/2016		4 15	888.45
	6/6/2016		5.02	887.58
01U579	10/4/2016	892.60	4.33	888.27
	3/14/2017		4 71	887.89
	2/13/2018		7.65	884.95
	8/13/2018		6 14	886.46
	5/29/2019		3.21	889.39
	12/3/2015		4 22	888.36
	2/3/2016		5 39	887 19
	4/7/2016		4 36	888.22
	6/6/2016		5 17	887.41
01U580	10/4/2016	892 58	4.51	888.07
010000	3/1//2017	002.00	4.86	887.72
	2/13/2018		7.00	884.64
	8/13/2018		6.25	004.04
	5/20/2010		3.58	880.00
	12/3/2015		3.30	887.85
	2/3/2015		5.25	007.00
	4/7/2016		-	007 70
	4/1/2010		3.32	007.70
0111501	0/0/2010	901 10	4.31	000.79
010561	10/4/2016	091.10	3.51	887.59
	3/14/2017		3.02	888.08
	2/13/2018		7.27	883.83
	8/13/2018		6.78	884.32
	5/29/2019		3.01	888.09
	12/3/2015		3.29	887.78
	2/3/2016		-	dry
	4/7/2016		3.40	887.67
	6/6/2016		4.31	886.76
01L581	10/4/2016	891.07	3.49	887.58
	3/14/2017		3.17	887.90
	2/13/2018		7.28	883.79
	8/13/2018		6.81	884.26
	5/29/2019		2.78	888.29
	12/3/2015		4.78	883.73
	2/3/2016		7.27	881.24
	4/7/2016		6.51	882.00
	6/6/2016		7.01	881.50
01U582	10/4/2016	888.51	5.19	883.32
	3/14/2017		7.31	881.20
	2/13/2018		10.29	878.22
	8/13/2018		7.63	880.88
	5/29/2019		3.6	884.91
	12/3/2015		4.61	883.72
	2/3/2016		7.09	881.24
	4/7/2016		6.35	881.98
	6/6/2016		6.85	881.48
01L582	10/4/2016	888.33	5.01	883.32
	3/14/2017		7.14	881.19
	2/13/2018		10.13	878.20
	8/13/2018		7.46	880.87
	5/29/2019		3.29	885.04
	12/3/2015		2.71	887.90
	2/3/2016		4	886.61
	4/7/2016		2.8	887.81
	6/6/2016		3.89	886.72
01U583	10/4/2016	890.61	2.91	887.70
	3/14/2017		3.55	887.06
	2/13/2018		6.8	883.81
	8/13/2018		5.18	885.43
	5/29/2019		1.91	888.70

#### Table 1, continued

		Inner		
		Casing	Depth to	Groundwater
Well	Date	Elevation	Water	Elevation
	12/3/2015		3.39	888.03
	2/3/2016		5.87	885.55
	4/7/2016		3.68	887.74
	6/6/2016		4.75	886.67
01L583	10/4/2016	891.42	3.78	887.64
	3/14/2017		4.65	886.77
	2/13/2018		7.85	883.57
	8/13/2018		6.26	885.16
	5/29/2019		2.99	888.43
	12/3/2015		3.15	887.75
	2/3/2016		-	dry
	4/7/2016		3.25	887.65
	6/6/2016		3.83	887.07
01U584	10/4/2016	890.90	3.32	887.58
	3/14/2017		3.16	887.74
	2/13/2018		7.05	883.85
	8/13/2018		5.6	885.30
	5/29/2019	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		888.01
	12/3/2015		3.00	887.70
	2/3/2016		3.97	886.73
	4/7/2016		3.13	887.57
	6/6/2016		3.87	886.83
01L584	10/4/2016	890.70	3.20	887.50
	3/14/2017		3.62	887.08
	2/13/2018		7.05	883.65
	8/13/2018		5.45	885.25
	5/29/2019		2.67	888.03

Elevations in feet above mean sea level

### Table 2 Groundwater Analytical Results Rice Creek Remeander

	Building 102 RRGs					01URC1	s			
Analyte	(ug/L)	12/3/2015	1/5/2016	4/7/2016	6/6/2016	10/4/2016	3/14/2017	2/13/2018	8/13/2018	5/29/2019
1,1,1,2-Tetrachloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-1 etrachioroethane		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1 1 2-Trichlorotrifluoroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1.1-Dichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethene	6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloropropene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2,3-Trichlorobenzene		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2,3-Trichloropropane		<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
1,2,4-Trichlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2,4-1 rimetnyibenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dibromoethane (EDB)		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.20	<0.20	<0.20
1 2-Dichlorobenzene		<0.50	<0.50	<0.50	<0.50	<0.50	< 0.50	<0.20	<0.20	<0.20
1.2-Dichloroethane		<0.25	< 0.25	<0.25	<0.25	< 0.25	< 0.25	< 0.25	< 0.25	<0.25
1,2-Dichloropropane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3,5-Trimethylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloropropane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2,2-Dichloropropane		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2 Chlorotoluono		<20	<20	<20	<20	<20	<20	<20	<20	<20
4-Chlorotoluene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Acetone		<20	<20	<20	<20	<20	<20	<20	<20	<20
Allyl chloride		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Benzene		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromobenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromochloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromotorm		<5.0	< 5.0	< 5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Carbon tetrachloride		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50 <0.50	<0.50	<0.50
Chlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Chloroform		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloromethane		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
cis-1,2-Dichloroethene	70	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.1	<1.0
cis-1,3-Dichloropropene		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Dibromochloromethane		<0.50	<0.50	<0.50	<0.50	< 0.50	< 0.50	< 0.50	< 0.50	<0.50
Diplorodifluoromothano		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Dichlorofluoromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl ether		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Ethylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Hexachlorobutadiene		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Isopropylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
m,p-Xylene		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Methyl Isobutyl Ketone		<5.0	< 5.0	<5.0	< 5.0	<5.0	<5.0	< 5.0	< 5.0	<5.0
Methylene chloride		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Naphthalene		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
n-Butvlbenzene		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
n-Propylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
o-Xylene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
p-Isopropyltoluene		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
sec-Butylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Styrene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrahydrofuran		<20	<20	<20	<20	<20	<20	<20	<20	<20
Toluene		<1.0	<10	<1.0	<10	<1.0	<1 0	<10	<10	<10
trans-1,2-Dichloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,3-Dichloropropene	1	<0.50	< 0.50	< 0.50	< 0.50	<0.50	<0.50	< 0.50	<0.50	<0.50
Trichloroethene	5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Trichlorofluoromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	0.18	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050

Units in micrograms per liter (ug/L). RRGs: recommended remediation goals BOLD: Building 102 contaminants of concern

#### Table 2, continued

	Building 102 RRGs	01URC1D								
Analyte	(ug/L)	12/3/2015	1/5/2016	4/7/2016	6/6/2016	10/4/2016	3/14/2017	2/13/2018	8/13/2018	5/29/2019
1,1,1,2-Tetrachloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-I richloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1.1.2-Trichlorotrifluoroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethene	6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloropropene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2,3-Trichlorobenzene		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2,3-Trichloropropane		< 0.20	<0.20	< 0.20	<0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
1,2,4-1 richlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1 2-Dibromo-3-chloropropane		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<2.5	<2.5	<2.5
1.2-Dibromoethane (EDB)		< 0.50	< 0.50	<0.50	<0.50	< 0.50	< 0.50	<0.20	<0.20	<0.20
1,2-Dichlorobenzene		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,2-Dichloroethane		<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
1,2-Dichloropropane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3,5-Trimethylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloropropane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichloropenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Butanone		<20	<20	<20	<20	<20	<20	<20	<20	<20
2-Chlorotoluene		<1 0	<10	<10	<10	<1 0	<10	<10	<1 0	<10
4-Chlorotoluene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Acetone		<20	<20	<20	<20	<20	<20	<20	<20	<20
Allyl chloride		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Benzene		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromobenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromochloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodicnioromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Carbon tetrachloride		<0.50	<0.50	<0.50	<0.50	< 0.50	<0.50	<0.50	<0.50	< 0.50
Chlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Chloroform		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloromethane		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
cis-1,2-Dichloroethene	70	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	5.7	2.9	1.9
cis-1,3-Dicnioropropene		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Dibromocniorometnane		<0.50	< 0.50	< 0.50	<0.50	< 0.50	< 0.50	< 0.50	<0.50	< 0.50
Dichlorodifluoromethane		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Dichlorofluoromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl ether		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Ethylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Hexachlorobutadiene		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Isopropylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
m,p-Xylene		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Methyl tert-butyl cthor		<5.U	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	<5.0	<5.U
Methylene chloride		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Naphthalene		<5.0	< 5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
n-Butylbenzene		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
n-Propylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
o-Xylene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
p-Isopropyltoluene		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
sec-Butylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Styrene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrahvdrofuran		<20	<20	<20	<20	<20	<20	<20	<20	<20
Toluene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,2-Dichloroethene	L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,3-Dichloropropene		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Trichloroethene	5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Trichlorofluoromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	0.18	<0.050	<0.050	<0.050	<0.050	<0.050	0.058	<0.050	0.086	<0.050

Units in micrograms per liter (ug/L). RRGs: recommended remediation goals BOLD: Building 102 contaminants of concerı

#### Table 2, continued

	Building 102 RRGs	01URC2S								
Analyte	(ug/L)	12/3/2015	1/6/2016	4/7/2016	6/6/2016	10/4/2016	3/14/2017	2/13/2018	8/13/2018	5/29/2019
1,1,1,2-Tetrachloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane		<0.50	< 0.50	< 0.50	<0.50	< 0.50	< 0.50	<0.50	<0.50	<0.50
1,1,2-I richloroethane		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,1,2-Inchlorothane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethene	6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1 1-Dichloropropene	U U	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1.2.3-Trichlorobenzene		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2,3-Trichloropropane		<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
1,2,4-Trichlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2,4-Trimethylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dibromo-3-chloropropane		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<2.5	<2.5	<2.5
1,2-Dibromoethane (EDB)		< 0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.20	<0.20	<0.20
1,2-Dichlorobenzene		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,2-Dichloroethane		<0.25	<0.25	<0.25	<0.25	< 0.25	< 0.25	<0.25	<0.25	< 0.25
1,2-Dicnioropropane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3,3-Thimethylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1.3-Dichloropropane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1 4-Dichlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2.2-Dichloropropane		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2-Butanone		<20	<20	<20	<20	<20	<20	<20	<20	<20
2-Chlorotoluene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
4-Chlorotoluene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Acetone		<20	<20	<20	<20	<20	<20	<20	<20	<20
Allyl chloride		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Benzene		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Bromobenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromochloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodicniorometnane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Carbon tetrachloride		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Chlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Chloroform		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloromethane		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
cis-1,2-Dichloroethene	70	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,3-Dichloropropene		< 0.50	<0.50	<0.50	<0.50	< 0.50	<0.50	< 0.50	< 0.50	< 0.50
Dibromochloromethane		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Dibromomethane		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Dichlorofluoromethane		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Ethylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Hexachlorobutadiene		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Isopropylbenzene	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
m,p-Xylene		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Methyl isobutyl ketone		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Methyl tert-butyl ether		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Naphthalene		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
n-Butylbenzene		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
n-Isopronyltoluene		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
sec-Butylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Styrene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
tert-Butylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrahydrofuran		<20	<20	<20	<20	<20	<20	<20	<20	<20
Toluene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,2-Dichloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,3-Dichloropropene	_	< 0.50	< 0.50	< 0.50	<0.50	<0.50	<0.50	< 0.50	< 0.50	< 0.50
	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
I richlorofluoromethane	0.40	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
vinyi chloride	0.18	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050

Units in micrograms per liter (ug/L). RRGs: recommended remediation goals BOLD: Building 102 contaminants of concerı

#### Table 2, continued

	Building 102 RRGs	01URC2D								
Analyte	(ug/L)	12/3/2015	1/6/2016	4/7/2016	6/6/2016	10/4/2016	3/14/2017	2/13/2018	8/13/2018	5/29/2019
1,1,1,2-Tetrachloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane		<0.50	< 0.50	< 0.50	<0.50	< 0.50	< 0.50	<0.50	<0.50	<0.50
1,1,2-I richloroethane		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,1,2-Inchlorothane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethene	6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1 1-Dichloropropene	U U	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1.2.3-Trichlorobenzene		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2,3-Trichloropropane		<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
1,2,4-Trichlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2,4-Trimethylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dibromo-3-chloropropane		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<2.5	<2.5	<2.5
1,2-Dibromoethane (EDB)		< 0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.20	<0.20	<0.20
1,2-Dichlorobenzene		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,2-Dichloroethane		<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	< 0.25
1,2-Dicnioropropane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3,5-mmethylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1 3-Dichloropropane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1.4-Dichlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2,2-Dichloropropane		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2-Butanone		<20	<20	<20	<20	<20	<20	<20	<20	<20
2-Chlorotoluene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
4-Chlorotoluene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Acetone		<20	<20	<20	<20	<20	<20	<20	<20	<20
Allyl chloride		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Benzene		< 0.50	< 0.50	<0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	<0.50
Bromobenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromochloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodicniorometnane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Carbon tetrachloride		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Chlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Chloroform		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloromethane		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
cis-1,2-Dichloroethene	70	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,3-Dichloropropene		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dibromochloromethane		< 0.50	<0.50	<0.50	<0.50	< 0.50	< 0.50	<0.50	< 0.50	<0.50
Dibromomethane		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Dichlorodifluoromethane		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Ethyl othor		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Hexachlorobutadiene		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Isopropylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
m,p-Xylene		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Methyl isobutyl ketone		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Methyl tert-butyl ether		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Naphthalene		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
n-Butylbenzene		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
sec-Butylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Styrene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
tert-Butylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrahydrofuran		<20	<20	<20	<20	<20	<20	<20	<20	<20
Toluene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,2-Dichloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,3-Dichloropropene		< 0.50	<0.50	<0.50	<0.50	<0.50	<0.50	< 0.50	< 0.50	<0.50
	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
I richlorofluoromethane	0.40	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
vinyi chloride	0.18	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050

Units in micrograms per liter (ug/L). RRGs: recommended remediation goals BOLD: Building 102 contaminants of concerı

**Bay West** 



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Ò} &[[•^åÁæ^ÁœÁ^•`|œÁ; Áæ] æf •^•Á; IÁ æ; ] |^•Á^&^ãç^åÁå ÁœÁæà[ ¦æ; |^Á; } ÁÉ DHEDFJÉQÁ[ `Á@æ;^Áæ) ^Á`^•ã; } •Á&[ } &A; } ā; \*Á
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Ü^•`|œ/Áæ/^Á,[o/áa|æ}\/Á&[¦!^&c/åÁ`}|^••Á,[c/åÁ;ãc@3;Ác@A^][¦dĂQEååããā;}æ||^ÊÁæ|ÁÛÔÁ^•`|œ/Á; ^^o/Á^``ã^{ ^} œ/Á }|^••Á,[c/åÈ

CE[Áræ;]|^•Á, āļÁa^Á^cæanj^å/à^Ă^^}åÁa^&@; & adÁ`}@; & adÁ`}|^••Á&;]+\*\*Á&;]+\*\*Á&;]\*\*{ ^å/ājÁ@; Áa); adÅi; AdA; AdÅi; AdÅ

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Ú¦^] æ^å⁄å^Ê ŠÒŌÒÞÖÁ/ÒÔPÞÔŒĂĴÒÜXÔÒÙÊÆDÔ Á

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Óæ̂Á∕ ^∙c	Ú¦[b/&dK	OEjæ†îca8æa†ÂÜ^¦ça8∧∙	
ÍÁÔ{]ãt^ÁÖ¦ãç^	Ú¦[b∿&oÁÞč{à^¦K	RFH€FIÏÈEË/Ô0EDEÚ	Y[¦∖ÁJ¦å^¦ÁÀKÁÁ FJ€GFGJ
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#### 5 B5 @MH=7 5 @F9 DCFH': CF'G5 A D@9 G

GUa d`Y`=8	@UVcfUhcfmi=8	A Uff]l	8 UhY GUad YX	8 UHY FYWY]jYX
UFWÜÔFÖ	FJ€ŒGGIËEF	Õ¦[ĭ}å,æe∧¦	€ÍÐGJÐFJÁFFKLÍ	€ÍÐHEÐFJÆÍÈIKHG
UFWÜÔFÖË	FJ€GFGJË€G	Õ¦[ĭ}å,æe∧¦	€ÍÐEJÐFJÆGÆ€€	€ÍÐHEÐFJÁKEÌ KHG
UFWÜÔFÙ	FJ€GFGJË€H	Õ¦[`}å,æe∧¦	€ÍÐGJÐFJÁFGKÍ€	€ÍÐHEÐFJÆÍÈ KHG
UFWÜÔGÙ	FJ€GFGJË€I	Õ¦[`}å,æe^¦	€ÍEÐJÆFÍKEÍ	€ÍÐHEÐFJÆÍÈ KHG
UFWÜÔGÖ	FJ€GFGJË€Í	Õ¦[`}å,æe^¦	€ÍEÐJEFJÁFÎKHÍ	€ÍÐHEÐFJÁÆÌKHG
Viật ÁÓ æ), \	FJ€GFGJËÊÎ	Yæe^¦	€ÍÐGJÐFJÁ€€F€€€	€ÍÐHEÐFJÆÍÈKHG

V^{]^¦æcĭ¦^Áà|æ}∖Á́æeÁ́,¦^•^}c

#### <u>G\]dd]b[`7cbHJjbYf`=bZcfaUhjcb</u>

8 YZUi `h7 cc`Yf

## V^{ ]^¦æč¦^ÁQ>ÔDAÁÆÈÈ

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## JC7<sup>∵</sup>,&\*\$6 @⁄[YbX`HYWIb]WU`GYfj]W¥gž=bW\*

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Surrogate: 4-Bromofluorobenzene	97.5			80-120 %		"	"	"	"	
Surrogate: Dibromofluoromethane	93.8			80-120 %		"	"	"	"	
Surrogate: Toluene-d8	101			80-120 %		"	"	"	"	
C%IF7%8!8`ff% \$&%&-!\$&LfcibX	′kUhYf <sup>™</sup> GUad`	YX. \$) #&-	<b>#%`%&amp;\$</b> \$`	···FYWY]jYX.	`\$)#\$#% <sup>``</sup>	,.'&				
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C% F7%8!8 ft% \$&%&-!\$&`L; fci	bXkUhYf‴GUad``	YX.`\$)#&	- #% `%&\$\$``	···F YWY]j YX	. `\$) # \$#% ``	,.'&					
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Surrogate: Dibromofluoromethane	91.5			80-120 %		"	"	"	"	
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Surrogate: 4-Bromofluorobenzene	94.2			80-120 %	•	"	"	"	"	
Surrogate: Dibromofluoromethane	93.8			80-120 %		"	"	"	"	
Surrogate: Toluene-d8	99.3			80-120 %		"	"	"	"	
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FÊGÊÊË ÊV¦a&@{[¦[à^}]:^}^	ŁFÈ€	FÈ€	€È€IJ	ĭ∗Њ	F	Ä	Ä	Ä	Ä	
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FÊGËĴĨāa¦[{[ËHË&@[];[];[]æ}^	ŁŒĚ	GĚ	€ÈEÏÌ	ĭ∗£Š	F	Ä	Ä	Ä	Ä	
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•^&#Őčćlà^}:^}^</td><td>ŁFÈ€</td><td>FÈ€</td><td>€È€GÍ</td><td>ĭ*₽Š</td><td>F</td><td>Ä</td><td>Ä</td><td>Ä</td><td>Ä</td><td></td></tr><tr><td>Ùĉ ¦^} ^</td><td>ŁFÈ€</td><td>FÈ€</td><td>€È€GF</td><td>ĭ*₽Š</td><td>F</td><td>Ä</td><td>Ä</td><td>Ä</td><td>Ä</td><td></td></tr><tr><td>c^¦dĐ̇̃č ĉ  à^}:^}^</td><td>ŁFÈ€</td><td>FÈ€</td><td>€È€H</td><td>č∗ĐŠ</td><td>F</td><td>Ä</td><td>Ä</td><td>Ä</td><td>Ä</td><td></td></tr><tr><td>V^dæ&@[: [^o@}}^</td><td>ŁFÈ€</td><td>FÈ€</td><td>€È€GÎ</td><td>ĭ∗Њ</td><td>F</td><td>Ä</td><td>Ä</td><td>Ä</td><td>Ä</td><td></td></tr><tr><td>V^dæ@å¦[~ĭ¦æ)</td><td>ŁG€</td><td>G€</td><td>€È€</td><td>ĭ*Њ</td><td>F</td><td>Ä</td><td>Ä</td><td>Ä</td><td>Ä</td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></tbody></table>												

Š^\*^}åÁ/^&@/3&aa†ÁÙ^¦ç3&^•ÉAQ&È



ÓæੰÁY^∙c ÍÁÒ{]ã^ÁÖ¦ãç^ ÙdĂÚæੱ ÉĂTÞÁÑÍF€H		لا:[ ه ۱:۲ ۱:۲	&dK &oÁp`{à^¦ &oÁTaè)a≛^	05,a¢îca&aa¢) KRFH€FIÏÈE KT¦ÈÄÜa&\Áx	ÂÙ^¦çã&^∙ =Ë/ÔŒEÉ (æ) Á©≣^}			Y [   Öæ	\ÁU¦å^¦ÁÀkÁÁ F ^ÁÜ^][¦c∿åK €	j€GFG] j∰GB⊅J	
JC7 <sup>°,</sup> ,&*\$6 @7[YbX`HYW[b]WU`GYfj]W¥gž=bW											
ĺŒj 懈 ơ^	Ü^∙` c	ÜŠ	ΤÖŠ	W}ã∙	Öãjĭcāį́}	Óæ&@	Ú¦^]æ¦^å	05;æ†î:^å	T^c@Įå	Þ[ c∿∙Á	
C%4 F7&8 ff% \$&%&-!\$)분;fcibXkUhm?	f <sup></sup> GUad`YX	(.`\$) <b>#8</b> - #∕	6 °% .' ) ····	`FYWY[]jYX.`\$)	#\$#% <sup>``</sup> ,.	&					
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V; <b>&amp;</b> @[  [ ^c@} } ^	Ł€Ě€	€Ě€	€È€GÎ	ĭ*⊞Š	F	Ä	Ä	Ä	Ä		
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Xāj^ Á&@[[¦ãā^	Ł€ÈÉÍ€	€ÈÉÍ€	€È€FH	ĭ*⊞Š	F	Ä	Ä	Ä	Ä		
Surrogate: 4-Bromofluorobenzene	96.7			80-120 %		"	"	"	"		
Surrogate: Dibromotluoromethane	94.0 101			80-120 %		"	"	"	"		
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FÊ=EÖ&&@[ ¦[ ^c@}}^	ŁFÈ€	FÈ€	€È€FÌ	ĭ∗Њ	F	Ä	Ä	Ä	Ä		
FÊ=EÖ&&@[ ¦[ ] ¦[ ] ^} ^	ŁFÈ€	FÈ€	€Ì€GÌ	č∗ĐŠ	F	Ä	Ä	Ä	Ä		
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FÊEÊÊË ÊZ/¦ãį ^c@ à^}:^}^	ŁFÈ€	FÈ€	€È€GG	č∗EŠ	F	Ä	Ä	Ä	Ä		
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Óæî ÁY^∙c Í ÁÔ{]ã^^ÁÔ¦ãç^ ÙdĂÚæĭ ∣ÉẤT ÞÁÑ Í F€H		8 % ]¦Ù 8 % ]¦Ù 8 % ]¦Ù	kdK koÁpř{à^¦h koÁTæ}æ≛^¦	OBjæ¢ica&æ¢i KRFH€FIÏB KT¦BÄÜa&\Á	ÁÛ^¦çã&^∙ FË/ÔŒEÉÚ Ka3)ÁŒ∏^}			Y [ ¦ Öæ:	\ÁU¦å^¦ÂùkÁÁ F. \ÁÜ^][¦ơ∿åK €	J€G∓GJ Ì∰FGB#J
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ĺŒ;æĵ ơ^	Ü^∙` c	ÜŠ	ΤÖŠ	W}ão∙	Öãµĭcãį}	Óæ&@	Ú¦^]æ¦^å	05jæ∳î:^å	T^c@Įå	Þ[ c∿∙Á
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dæ)•ËÊÊËÖ&&@[¦[]¦[]^}^	Ł€Ĭ€	€Ĕ€	€È€FH	 č∗EŠŠ	F	Ä	Ä	Ä	Ä	
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Xāj^ Á&@q[¦ãã^	Ł€ÈÉÍ€	€ÈÉÍ€	€È€FH	č∗⊞Š	F	Ä	Ä	Ä	Ä	

Š^\*^}åÁ/^&@/a&æ‡ÁÙ^¦ça&^•ÉQ&È



ÓæੰÁY^∙c ÍÃO{]ã^∕Æට¦ãç^ ÙŒĂÚæ'∣ÉATÞÁMÍÍF€H		ଏ   Ù ଏ   Ù ଏ   Ù	&oK &oAp`{à^¦ &oATa)a;**	O5jæ†îca&æ‡ KRFH€FIÏÈ ¦KT¦ÈÄÜa&\Ás	ÁÛ^¦çã&^∙ FË/ÔOEDEÚ ⟨æ}ÁOE∏^}			Y[] Öæ	¦\Á∪¦å^¦ÁÀKÁÁ F ጵÁÜ^][¦c∿åK€	J€GFGJ Ĵ∰GÐFJ
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ĺŒj æ∲` ơ^	Ü^∙`  c	ÜŠ	ΤÖŠ	W}ãe∙	Öãjĭcāį}	Óæ&@	Ú¦^]æ <sup>i</sup> ^å	05jæ†î:^å	T^c@Įå	Þ[ ♂•Á
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Surrogate: 4-Bromofluorobenzene	94.4			80-120 %		B9F0308	06/02/19	06/02/19	EPA 8260B	
Surrogate: Dibromofluoromethane	92.2			80-120 %		"	"	"	"	
Surrogate: Toluene-d8	97.4			80-120 %		"	"	"	"	



ÓæÂ∕Y^∙c	Ú¦[b/&dK	OĘ, æ†, ca&æ‡ÂŲ^¦ça&^∙	
ÍÁÖ{]ã^ÁÖ¦ãç^	Ú¦[b∿&oÁÞ~`{à^¦K	RFHEFIÏÈFË/ÔOEDEÚ	Y[¦∖ÁJ¦å^¦Â¥KÁÁ FJ€GFGJ
ÙdĂÚæĭ∣ÉATÞÁÍÍF€H	Ú¦[b∿&oÁTæ)æ*^¦k	(T¦ÈÄÜa8λÁxaa)ÁΩЩ^}	Öæe^ÁÜ^][¦c∿åK €Î ⊞FGBFJ

#### JC7', &\* \$6'!'EiU']hm7cblfc` @[YbX'HYW[b]WU'GYfj]W¥gž=bW

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FEFED3&@[]   [ ^ 0@#) ^	ŁAFE€	FE€	€EEF€	* <b>E</b> S							
FEFED&@{[ \[ ^o@ \ } ^	ŁAFE€	FE€	€EEFI	°*⊞S ∵							
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FEGHEV/a&@{[ \[ à^ } : ^ } ^	ŁAIE€	IE€	€EEĨH	**£\$\$							
FEGHEV/&&@[:[]:[]:a)^	ŁÆEG€	€EC€	ۮH	**£\$\$							
FEEEE EV/a&@{[ +[ à^} : ^} ^	ŁAFE€	FE€	€EEIJ	`*⊞\$\$							
FÊGÊÊÊ/¦ã{ ^ c@ à^}:^}^	ŁÁFÈ€	FÈ€	ۃECG	č*E\$Š							
FÊGÊÔãa¦[{[ÊHÊ&@[[:[]];]];a;)^	ŁÁGÉ	GĒ	€ĒĒÎİ	č*E\$Š							
FÊEËDãa¦[{ [^c@e);^ÁÇDÖÓD	ŁÆÈ€€	€ÈĐ€	€EEFG	č*E\$Š							
FÊ9ËÖ&&@{[¦[à^}:^}^	ŁÆĚ€	€Ě€	ۃEGH	ĭ*Њ							
FÊEÊD&@[  [^o@e)}^	ŁÆÈGÍ	€ÈÉÍ	€È€CG	ĭ*Њ							
FÊEÖ&&@[¦[]¦[]æ}^	ŁÆRÈ€	FÈ€	€È€CÏ	ĭ*Њ							
FÊ÷HÉËË√¦ãį^c@/ à^}:^}^	ŁÆrÈ€	FÈ€	€È€GÎ	ĭ*Њ							
FÊHÊÖ&&@{[¦[à^}:^}^	ŁÆrÈ€	FÈ€	€È€HÌ	ĭ*Њ							
FÊHÊÖ&&@{[¦[]¦[]æ}^	ŁÆrÈ€	FÈ€	€È€H	ĭ*Њ							
FÊE ËD&&@{[¦[à^}:^}^	ŁÆrÈ€	FÈ€	€È€FJ	ĭ∗Њ							
GÊEÖ&&@[ ¦[ ] ¦[ ] æ}^	ŁÁÈŒ	ÍÈ€	€È€	ĭ*Њ							
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OB&^d; } ^	ŁÁG€	G€	€ÈHG	ĭ*Њ							
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Ó^}:^}^	ŁÆĒĚ€	€Ě€	€È€FÍ	ĭ*Њ							
Ó¦[{ [à^}:^}^	ŁÁFÈ€	FÈ€	€È€CÏ	ĭ*Њ							
Ó¦[{[&@][¦[{ ^o@e)}^	ŁÁFÈ€	FÈ€	€È€HG	ĭ*Њ							
Ó¦[{[å&&@[¦[{^c@æ}}^	ŁÁFÈ€	FÈ€	€È€FÍ	ĭ*Њ							
Ó{[ { [ <del>-[</del> ¦{	ŁÁÈ€	ÍÈ€	€Ì€FÍ	č∗EŠ							
Ó¦[{ [{ ^c@ee}}^	ŁÁGĚL	GĚ	€ÈÉÍ€	č∗EŠ							
Ôælà[}Áx^dæ&@[¦ãã^	ŁÆĖĚ€	€Ě€	€È€GÏ	ĭ*Њ							
Ô@[  [ à^} : ^} ^	ŁÆRÈE	FÈ€	€ÈÉÎF	č∗EŠ							
Ô@[¦[^o@eee}^	ŁÁGĚ	GĚ	€ÈÉÎF	ĭ*Њ							
Ô@[  [ -{  {	ŁÁFÈ€	FÈ€	€È€FH	ĭ*Њ							
Ô@[¦[{ ^c@æ}^	ŁÁGĚL	GĚ	€È€GÏ	č∗EŠ							
&#####################################</td><td>ŁÁFÈ€</td><td>FÈ€</td><td>€È€GG</td><td>ĭ*Њ</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></tbody></table>											



ÓæÎÁY ^∙c	Ú¦[b/&dK	OEjæ†îcã&æa†ÂÛ∧¦çã&∧∙	
ÍÁÒ{]ã^^ÁÖ¦ãç^	Ú¦[b∿&oÁÞč{à^¦K	KRFH€FIÏÈEË/ÔŒŒÚ	Y[¦\ÁJ¦å^¦ÄÀkÁÁ FJ€GFGJ
ÙdĂJæĭlÉATÞÁNÍF€H	Ú¦[b∿&oÁTæ)æ*^¦I	K⊤¦ÈÄÜa&Áxaa)ÁO∰^}	Öæe^ÁÜ^][¦ơ∿åK €Î ⊞FGBFJ

#### JC7`, &\*\$6`!`EiU]lmi7cblfc` @{[YbX`HYW{b]WU`GYfj]WVgz=bW

					ù∎ã∧	×۱: ۲		ÃÜÒÔ		ÃÜÚÖ	
ŔŒ;æĵrœ^	Ü^∙`  c	ÜŠ	ΤÖŠ	W}ão∙	Š^ç^	Ü^• ઁ  c	ÃÜÒÔ	Šą̃ão	ÃÜÚÖ	Šą̃ãc	Þ[ c∿∙Á
6 UH/V(`6-:\$'\$,`!`9 D5`)\$'\$7`K UHYf`fDif	[Y'UbX'H	fUdŁ									
6`Ub_`f6-:\$'\$,!6@?%L					Ú¦^]æ¦^å	áÁBÁQE;æ∳`:∕	∖åkk€Î BEGB	FJÁ			
&ãËÉÉEEÖ3&@[¦[]¦[]^}^	ŁÆĖĚ€	€Ě€	€È€G	ĭ∗Њ							
Öâa¦[{[&@{[¦[{ ^c@aa})^	ŁǼĒĚ€	€Ľ€	€È€GF	č∗EŠ							
Öâa¦[{[{^c@ee}}^	ŁÁGĚL	GĚ	€È€GÎ	č∗EŠ							
Öa&@{[¦[åã∔ĭ[¦[{ ^c@æ}}^	ŁÁÈ€	ÍÈ€	€È€H€	č∗EŠ							
Öa&@[[¦[, ĭ[{ ^o@aa)^	ŁÁFÈ€	FÈ€	€È€G	ĭ∗Њ							
Òo@ Á\o@\	ŁÁÍÈ€	ÍÈE	€ÈEH€	ĭ*Њ							
Òo@ à^}:^}^	ŁÆFÈ€	FÈ€	€È€CF	ĭ*Њ							
P^¢æ&@{[¦[àčæåå}}^	ŁÁGĚL	GŤ	€ÈEG	ĭ*Њ							
@[]¦[]^ à^}:^}^	ŁÆFÈ€	FÈ€	€È€FJ	ĭ*Њ							
{	ŁÁGÈ€	GÈ€	€ÈEIÍ	ĭ*Њ							
T^c@ Áær[àčć Á^d[}^	ŁÁÍÈ€	ÍÈE	€ÈÈÌG	ĭ*Њ							
T^c@ Ác∿¦dãič( Árc@;¦	ŁÁFÈ€	FÈ€	€ÈÉÍ€	ĭ*Њ							
T^c@ ^}^ <b>Á&amp;@</b> [¦ãâ^	ŁÁGĚ	ŒĚ	€È€	ĭ*Њ							
Þæ]@@æ/}^	ŁÁÍÈ€	ÍÈE	€È€HÍ	ĭ*Њ							
} ËĎ` ĉ  à^} : ^} ^	ŁÁGĚ	GŤ	€ÈEIÍ	č*ĐŠ							
} Ü̈́́́́́́́́́¦[]^ à^}:^}^	ŁÆRÈ€	FÈ€	€ÈEHF	č*ĐŠ							
[ĔY^ ^}^	ŁÆFÈ€	FÈ€	€È€FÍ	č*EŠŠ							
] Ë@[ ] ¦[ ] ^  d[  ´ ^} ^	ŁÁGĚ	GŤ	€È€GF	č*ĐŠ							
•^&ËϢć  à^}:^}^	ŁÆFÈ€	FÈ€	€È€GÍ	č*ĐŠ							
Ùổ ¦^} ^	ŁÆFÈ€	FÈ€	€È€GF	č*EŠŠ							
ơ∿¦dĐ̃Č ĉ  à^} : ^} ^	ŁÆFÈ€	FÈ€	€È€H	č*ĐŠ							
V^dæ&@{[¦[^c@}}^	ŁÆFÈ€	FÈ€	€È€GÎ	č*ĐŠ							
V^dæ@å¦[~ĭ¦æ)	ŁÁG€	G€	€È€	č*EŠŠ							
V[  `^} ^	ŁÆFÈ€	FÈ€	€È€FH	č*EŠŠ							
dæ)•ËÊËË®&@{[¦[^œ}}^	ŁÆrÈ€	FÈ€	€ÈÉÍ€	č∗Њ							
dæ)•ĒÉĒĒÕ&@[ ¦[ ] ¦[ ] ^}^	ŁÆĖĚ€	€Ě€	€È€FH	č∗Њ							
V¦a&@[  [ ^c@}}^	ŁÆĖĚ€	€Ě€	€È€GÎ	č∗EŠ							
V¦a&@{[¦[- ĭ[{ ^c@æ)}^	ŁÆrÈ€	FÈ€	€ÈG	č∗EŠŠ							
Xã)^ Á&@{[¦ãa^	ŁÁ€È€Í€	€ÈÉÍ€	€È€FH	č*ĐŠ							
Surrogate: 4-Bromofluorobenzene	43.0			ug/L	46.6		92.3	80-120			
Surrogate: Dibromofluoromethane	42.8			ug/L	46.6		91.8	80-120			
Surrogate: Toluene-d8	44.9			ug/L	46.6		96.3	80-120			
@7 G`f6 - : \$' \$, !6 G%L					Ú¦^]æ¦^å	áÁBÁ05;æ†î:∕	∖åkk€Î <del>B</del> €GB	FJÁ			
FÊFÊFÊEË/^dæ&@{¦[^c@æ}^	I FÈ	FÈ€	€È€H	č*ĐŠ	IÏÈ€	ŁFÈ€	ÌÌÈE	Ì€ËFG€			
FÊFÊFÖ/¦&&@[¦[^c@ee)^	IFÈ€	FÈ€	€È€IG	č*EŠŠ	IÏÈ€	ŁFÈ€	ÌÏÈG	Ì€ËFG€			
FÊÊÊÊÊ/^dæ&@[¦[^o@e)^	Í FÈ	€Ě€	€È€FÌ	č*ĐŠ	IÏÈ€	Ł€Ě€	FF€	ΪΪÈĖËGF			
FÊFÊ2Ë/¦&&@[¦[^c@+)^	ΙÍÈ	€Ľ€	€È€FÌ	č*EŠŠ	IÏÈ€	Ł€Ě€	JÏĖ	Ì€ËFG€			
FÊFÊGÊK/¦&&@{[¦[dã]ĭ[¦[^c@ee)}^	ΙÍÈÈ	FÈ€	€È€HH	č*EŠŠ	IÏÈ€	ŁFÈ€	JÏÈ	Ì€ËFŒ			
FÊEÊĴ&@[[¦[^c@#}^	IÌÈG	FÈ€	€ÈEF€	ĭ∗Њ	ΙΪÈ€	ŁFÈ€	F€H	Ì€ËFG€			

Š^\*^}åÁ/^&@/a&æ‡ÁÙ^¦ça&^•ÉQ&È



ÓæÎÁY ^∙c	Ú¦[b%&cK	OEj憰cã&æa†ÂÛ^\¦çã&∧∙	
ÍÁÔ{]ãi^ÁÖ¦ãç^	Ú¦[b∿&oÁp`{à^¦K	RFH€FIÏÈEË/ÔŒŒÚ	Y[¦\ÁJ¦å^¦ÁÀkÁÁFJ€GFGJ
ÙdĂÚæĭ∣ÊATÞÁÄÍF€H	Ú¦[b∿&oÁTæ)æ*^¦∤	<⊤¦ĚÄÜæλ, Áxæ), ÁΩ≣ ^}	Öæe^ÁÜ^][¦ơ∿åK €Î ĐFGĐFJ

#### JC7<sup>·</sup>, &\*\$6<sup>·</sup>!'EiU]lmi7 cblfc` @{[YbX'HYW[b]WU'GYfj]W¥gž**=**bW

₩05,械¢^	Ü^∙` c	ÜŠ	ΤÖŠ	₩}ã••	Ù] ã ^ Š^ç^∣	Ù[ ˘¦&^ Ü^∙˘ c	à ÜÒÔ	à ÜÒÔ Šãįão•	à ÜÚÖ	à ÜÚÖ Šąįãc	Þ[ ♂∙Á
6 UHW(`6-:\$'\$,`!`9 D5`)\$'\$7`K	Uhyf`fDif[Y`UbX`H	fUdŁ									
@7 G`f6 - : \$' \$, !6 G%L					Ú¦^]æ¦^å	áÁBÁ05;æ†î:∕	∖åk∕€Î⊞€GE	₽JÁ			
FÊEÖ&@[  [ ^o@} ^	ΙÍÈ	FÈ€	€È€FÌ	č∗ĐŠ	- IÏÈ€	ŁFÈ€	JÏÈ	Ì€ËFG€			
FÊ=EÖ3&@[ ¦[ ] ¦[ ] ^} ^	ΙΪÈÈ	FÈ€	€È€CÌ	ĭ∗Њ	IÏÈ€	ŁFÈ€	F€F	Ì€ËFG€			
FÊGÊÊË/¦&&@{{;{à^}:^}^	HÌÈG	ĺÈ€	€È€ÎH	ĭ∗Њ	IÏÈ€	ŁÍÈ€	ÏΪÈ€	Ï€ËH€			
FÊ3Ê+Ë/¦&&@{[¦[]¦[] æ}^	IÌÈ	€ÈĐ€	€ÈEH	č∗EŠŠ	IÏÈ€	Ł€È€€	F€G	ÏÎËËFG€			
Ff£31Ê Ë/¦a&@{[¦[à^}:^}^	НË	FÈ€	€È€IJ	č∗EŠ	IÏÈ€	ŁFÈ€	ΪÌÈ	Ï€ËH€			
FÊGÊÊËV¦ã[^c@ à^}:^}^	ΙΪĚ	FÈ€	€È€GG	č∗EŠ	IÏÈ€	ŁFÈ€	F€F	Ì€ËFG€			
FÊBËÖãa¦[{[ЁHË&@[¦[]¦[]æ})^	l) È	GĚ	€ÈEÏÌ	č∗EŠ	IÏÈ€	ŁŒĚ	F€G	ΪÍËEGÍ			
FÊBËÖãa¦[{ [^c@a);^ÁÇÖÖÓD	I HÈF	€È€	€È€FG	č∗EŠ	IÏÈ€	Ł€È€€	JFĒ	Ì€ËG€			
FÊBËÖ3&@[[¦[à^}:^}^	llȀ	€ĽĚ€	€È€GH	č∗EŠ	IÏÈ€	Ł€Ě€	JHĒÈ	ΪÍËEGÍ			
FÊBÊÖ&&@[¦[^c@eb)^	HÌ Ě	€ÈÍ	€È€GG	č∗EŠ	IÏÈ€	Ł€ÈŚ	ÌGÈ€	ïìÈGËFG€			
FÊBËÖ&&@{[¦[]¦[]aa}^	ΙΪÈG	FÈ€	€È€GÏ	č∗EŠ	IÏÈ€	ŁFÈ€	F€€	Ì€ËG€			
FÊHÊËË/¦ãį,^c@/ à^}:^}^	ΙΪĚ	FÈ€	€È€GÎ	č∗EŠ	IÏÈ€	ŁFÈ€	F€F	Ì€ËG€			
FÊHÊÖ3&@[[¦[à^}:^}^	ΙΙÈ	FÈ€	€Ì€HÌ	č∗EŠ	IÏÈ€	ŁFÈ€	JÍĚ	ΪÍËEGÍ			
FÊHËÖ&&@{[¦[]¦[]æ})^	IHÈ	FÈ€	€È€H	č∗EŠ	IÏÈ€	ŁFÈ€	JGÈ	Ì€ËG€			
FÊLËÖ3&@{[¦[à^}:^}^	ЦÈG	FÈ€	€È€FJ	č*ĐŠ	IÏÈ€	ŁFÈ€	JIÈÈ	ΪÍËEGÍ			
GÊGËÖ&&@{[¦[]¦[] æ})^	IÎÈ	ÍÈ€	€È€	č∗EŠ	IÏÈ€	ŁĺÈ€	JÌÈ	Ï€ËFHÎ			
GËČĭœa}[}^	Í€ÈG	G€	€ÌHÏ	č∗EŠ	IÏÈ€	ŁG€	F€Ï	ΪÍËEGÍ			
GËÔ@{[¦[d[ ĭ^}^	ΙΪÈ	FÈ€	€È€FÏ	č*ĐŠ	IÏÈ€	ŁFÈ€	F€G	Ì€ËFG€			
IËÔ@{[¦[d[ ĭ^}^	IÎ È	FÈ€	€È€HF	č∗EŠ	IÏÈ€	ŁFÈ€	JJĚ	Ì€ËFG€			
OB2^d[}^	ΙΪÈÈ	G€	€ÈHG	č∗EŠ	IÏÈ€	ŁŒ	F€G	ΪÍËEGÍ			
Œ⋕ˆ│Á&@{[¦ãâ^	ÍGÈ€	ÍÈ€	€È€IG	č*ĐŠ	IÏÈ€	ŁÍÈ€	FFF	ΪΪËΕGF			
Ó^}:^}^	lÎÈ€	€ĽĚ€	€È€FÍ	č*ĐŠ	IÏÈ€	Ł€ĽĚ€	JÏÈ	Ì€ËFG€			
Ó¦[ { [ à^} : ^} ^	I I Ē	FÈ€	€È€GÏ	č*ĐŠ	IÏÈ€	ŁFÈ€	JÍÈ€	Ì€ËFG€			
Ó¦[{[&@[¦[{ ^o@ee})^	IJÈG	FÈ€	€È€HG	ĭ∗Њ	IÏÈ€	ŁFÈ€	F€Í	Ì€ËFG€			
Ó¦[{[åã&@{[¦[{^c@æ}}^	I GÈH	FÈ€	€È€FÍ	ĭ∗Њ	IÏÈ€	ŁFÈ€	J€È	Ì€ËFG€			
Ó{[ { [ <del>]</del> } }{	I GË	ÍÈ€	€È€FÍ	ĭ*Њ	IΪÈ€	ŁÍÈ€	J€È	ÏJËËŒ€			
Ó¦[{[{^c@ee}}^	IJÈH	GĚ	€ÈÉÍ€	ĭ∗Њ	IÏÈ€	ŁŒĚ	F€Í	ïÍËEGJ			
Ôælà[}Ác^dæ&@[¦ãa^	I€È	€ĽĚ€	€È€GÏ	ĭ∗Њ	IÏÈ€	Ł€Ě€	ÌΪÈ€	Ì€ËFG€			
Ô@{[ ¦[ à^} : ^} ^	I GË	FÈ€	€ÈÉÎF	ĭ∗Њ	IÏÈ€	ŁFÈ€	J€È	Ì€ËFG€			
Ô@{[¦[^c@#}^	ÍHÈ	GĚ	€ÈÉÎF	ĭ∗Њ	IÏÈ€	ŁŒĚ	FFÍ	ïÍËEGÍ			
Ô@{[¦[- <del>[</del> ]{	IHÈ	FÈ€	€È€FH	ĭ∗Њ	IÏÈ€	ŁFÈ€	JHÈG	Ì€ËFG€			
Ô@[¦[{ ^o@ee}^	ÍÌÈ	GŤ	€È€GÏ	ĭ∗Њ	IÏÈ€	ŁŒĬ	FG	Ï €ËFH€			
&ã ËFÉEËÖ&@[ ¦[ ^o@} } ^	ΙΪĚ	FÈ€	€È€GG	ĭ∗Њ	IÏÈ€	ŁFÈ€	F€F	Ì€ËFG€			
&ãËEÊEÖ&@[ ¦[ ] ¦[ ] ^} ^	l Î È	€Ě€	€È€G	ĭ∗Њ	IÏÈ€	Ł€Ě€	JÌÈ€	Ì€ËFG€			
Öâa¦[{[&@{[¦[{ ^o@aa}}^	I GÈF	€Ě€	€È€GF	ĭ∗Њ	IΪÈ€	Ł€Ě€	ÌJĚ	Ì€ËFG€			
Öâa¦[{ [{ ^c@ee}}^	I I È	GŤ	€È€GÎ	ĭ∗Њ	IΪÈ€	ŁŒĬ	JIĚ	Ì€ËFG€			
Ö&&@[¦[åã∔ĭ[¦[{^c@æ}}^	ПÈ	ÍÈ€	€È€H€	ĭ∗Њ	IΪÈ€	ŁÍÈ€	JHÈÈ	Ï€ËËGÌ			
Ö&&@[¦[⊣ĭ[¦[{ ^o@ee)^	Í€Ì	FÈ€	€È€G	ĭ∗Њ	IΪÈ€	ŁFÈ€	F€Ì	ΪÍËEGÍ			
Òc@ Ác@¦	ΙΪĚ	ÍÈ€	€È€H€	č∗£Š	IÏÈ€	ŁĺÈ€	F€F	Ì€ËFG€			



ÓæÎÁY ^∙c	Ú¦[b%&cK	O5j憰ca8æ¢AÛ^¦ça8∧∙	
ÍÁÔ{]ãi^ÁÖ¦ãç^	Ú¦[b∿&oÁp`{à^¦K	RFH€FIÏÈEË/Ô060€Ú	Y[¦\ÁJ¦å^¦ÁÀkÁÁ FJ€GFGJ
ÙdĂÚæĭ∣ÊATÞÁÄÍF€H	Ú¦[b∿&oÁTæ)æ*^¦∤	(T¦ÈÄÜa&∖Áxaa)Á0E∥^}	Öæe^ÁÜ^][¦c∿åK €Î BFGBFJ

#### JC7`, &\* \$6`!`EiU]lmi7 cblfc` @[YbX`HYW[b]WU`GYfj]WYgž=bW

					Ù]ã^	Ù[≚¦&^		à ÜÒÔ		à ÜÚÖ	
ĺŒ;æ†`ơ∿	Ü^∙	ÜŠ	ΤÖŠ	W}ão∙	Š^ç^	Ü^∙` c	ÃÜÒÔ	Šą̃ are	à ÜÚÖ	Šą̃āc	Þ[ ♂∙Á
6 UHWI `6 - : \$' \$, `!`9 D5`) \$' \$7 `K UHYf`fDif	[Y'UbX'H	fUdŁ									
@7 G f6 - : \$' \$, !6 G%L	-				Ú¦^]æ¦^å	μÁBÁQE[æ∳`:∕	∖åkk€Î B€GE	₹JÁ			
Òc@ à^}:^}^	١١Ě	FÈ€	€Ì€GF	č∗EŠ	ıïÈ€	ŁFÈ€	JIĒ	Ì€ËG€			
P^¢æ&@{[¦[àčæåå}}^	IFÈF	GĚ	€ÈG	č∗ĐŠ	IÏÈ€	ŁŒĚ	ÌÏÈH	Ï€ËH€			
<b>@</b> []¦[]^ à^}:^}^	IÌÈ	FÈ€	€È€FJ	ĭ∗Њ	IΪÈ€	ŁFÈ€	F€H	ïìÈËFG€			
{	ÌÏĔ	GÈ€	€ÈEIÍ	ĭ∗EŠŠ	JIÈ€	ŁGÈ€	JHÈE	Ì€ËG€			
T^c@ Áæī[àčĉ Á^d[}^	IÌÈH	ÍÈ€	€ÈÈÈG	č∗EŠ	IÏÈ€	ŁĺÈ€	F€H	Ì€ËEG€			
T^c@ Áe∿¦dĒa≚č Á*c@e¦	ΙÌĖΪ	FÈ€	€ÈÉÍ€	č∗£Š	IÏÈ€	ŁFÈ€	F€	Ì€ËG€			
T^c@ ^}^ <b>Á&amp;@</b> [¦ãå^	IIÈ€	GŤ	€È€	č*EŠŠ	IÏÈ€	ŁGĚ	JHĒÈ	ÏJÈÐËFG€			
Þæ]@@æ#^}^	IHÈÈ	ÍÈ€	€Ì€HÍ	č∗EŠ	IÏÈ€	ŁÍÈ€	JHÈE	Ï€⊞ÊĜ			
} ËĎ` ĉ  à^} : ^} ^	Í€Ì	GŤ	€È€IÍ	ĭ*Њ	IÏÈ€	ŁŒĚ	F€Ï	ΪÍËEGÍ			
} Ё́Ú¦[]^ à^}:^}^	IJÈ	FÈ€	€È€HF	ĭ*Њ	IÏÈ€	ŁFÈ€	F€Í	Ì€ËG€			
[ĔY^ ^}^	IHÈÈ	FÈ€	€È€FÍ	ĭ∗Њ	IÏÈ€	ŁFÈ€	JFÈ	Ì€ËG€			
] ËEQ[] ¦[] ^  d[   ` ^} ^	IÌÈ	GĚ	€È€GF	ĭ∗Њ	IΪÈ€	ŁŒĚ	F€	ÏÍËEGÍ			
•^&ËĎčć à^}:^}^	ΙÌË	FÈ€	€È€GÍ	č*EŠŠ	IÏÈ€	ŁFÈ€	F€	ΪÍËEGÍ			
Ùc ¦^} ^	IHÈH	FÈ€	€È€GF	č*EŠŠ	IÏÈ€	ŁFÈ€	JŒ€	̀ˌ			
ơ°¦dĐ̃Č ć  à^}:^}^	IÌÈ€	FÈ€	€È€H	č∗EŠ	IÏÈ€	ŁFÈ€	F€G	̀ˌ			
V^dæ&@{[¦[^c@}}^	ΙHĒĖ	FÈ€	€Ì€GÎ	č∗EŠ	IÏÈ€	ŁFÈ€	JŒÌ	̀ˌ			
V^dæ@å¦[~覿)	ÍΙÈE	G€	€È€	č*EŠŠ	IÏÈ€	ŁG€	FFÍ	ΪÍ⊞EÍ			
V[  `^}^	ΙÍÈÈ	FÈ€	€È€FH	č*Њ	IÏÈ€	ŁFÈ€	JÏĚ	Ì€ËG€			
dæ)•ĒĒĒÐ&@[¦[^@}}^	IÌÈE	FÈ€	€È€Í€	ĭ*Њ	IÏÈ€	ŁFÈ€	F€G	Ì€ËG€			
dæ)•ËÊÊÊÊÊæ@[¦[]¦[]^}^	IHÈ	€Ě€	€È€FH	č*Њ	IÏÈ€	Ł€Ě€	JHÈÈ	Ì€ËG€			
V¦&&@{[ ¦[ ^c@} } ^	IÍÈ€	€Ě€	€È€GÎ	ĭ∗Њ	IÏÈ€	Ł€Ě€	JÍÈ	Ì€ËG€			
V¦a&@{[¦[+]~[¦[{ ^o@ee})^	ΙÍÈΕ	FÈ€	€ÈG	ĭ∗Њ	lΪÈ€	ŁFÈ€	JÎÈ€	ÏÍËEGÌ			
Xāj^ Á&@[[¦ãå^	ÍÏÈ	€È€Í€	€È€FH	ĭ∗Њ	lΪÈ€	Ł€ÈÉÍ€	FGG	ΪÍËΕΉ€			
Surrogate: 4-Bromofluorobenzene	49.8			ug/L	46.6		107	80-120			
Surrogate: Dibromofluoromethane	44.2			ug/L	46.6		94.9	80-120			
Surrogate: Toluene-d8	47.2			ug/L	46.6		101	80-120			
AUff]I`Gd]_Y`f6-:\$'\$,!AG%L	G	ScifW¥∵	% \$&%&- !\$	5%	Ú¦^]æ¦^å	kk€Î BEGBFJ	ÁKOB;æ†î:^a	åkÆÎ <del>B€HDF</del> J	Á		
FÊÊÊÊÊA^dæ&@{;¦[^oœee)^	IIÈ€	FÈ€	€È€H	ĭ∗Њ	IΪÈ€	ŁFÈ€	JHËL	Ì€ËG€			
FÊFÊFÅ/¦&&@{[ ¦[ ^ c@æ); ^	ΙÎĒ	FÈ€	€È€IG	ĭ∗Њ	IÏÈ€	ŁFÈ€	IJÈG	Ì€ËG€			
FÊÊÊÊÊÊÅ^dæ&@{[¦[^oœe)}^	ÍFÈ	€Ě€	€È€FÌ	ĭ∗Њ	IÏÈ€	Ł€Ě€	FF€	ΪÍËEGÍ			
FÊFÊEË/¦&&@{[ ¦[ ^ c@ee) ^	ΙΪĖ	€Ě€	€È€FÌ	ĭ∗Њ	IÏÈ€	Ł€Ě€	F€F	Ì€ËG€			
FÊFÊGË/¦3&@{[¦[dã ǐ[¦[^o@æ)}^	II È	FÈ€	€ÈEHH	ĭ∗Њ	IΪÈ€	ŁFÈ€	JIĒ	ÏÍÈÈËG€			
FÊFËD&&@[; [^c@ee)^	ÍFË	FÈ€	€È€F€	ĭ∗Њ	IΪÈ€	ŁFÈ€	FF€	̀ˌ			
FÊFËD&B@[; [^c@}}^	ÍÍÈ	FÈ€	€È€FÌ	ĭ∗Њ	IΪÈ€	ŁFÈ€	FFÌ	̀ˌ			
FÊFÊÖ&&@[ ¦[ ] ¦[ ] ^} ^	Í€Ë	FÈ€	€È€CÌ	č*EŠŠ	lΪÈ€	ŁFÈ€	F€Ì	Ì€ËG€			
FEEHEV;1a8;04[;1[à^}:^}^	ΗÈ	ÍÈ€	€ÈÉÎH	č∗EŠ	lΪÈ€	ŁĺÈ€	ΪΗÈ	Ï€ËH€			
FÊ3ÊHÊ/¦&&@{[¦[]¦[]æ})^	ЦÌÈ	€È€	€È€H	č∗EŠ	lÏÈ€	Ł€È€€	F€H	ÏÍËFGG			
FEGHE EV/: a&@{[: [à^}: ^} ^	Н́Ё	FÈ€	€È€IJ	ĭ*Њ	IÏÈ€	ŁFÈ€	ΪÌÈ	Ï€ËH€			
FEEEE EV/ ã { ^ c@  à^} : ^ } ^	ΙİÈ	FÈ€	€È€GG	ĭ*Њ	IÏÈ€	ŁFĖ€	F€	Í€ËG€			



ÓæÎÁY ^∙c	Ú¦[b/&dK	OEjæ†`ca&æa†ÁÜ^¦ça&∧∙	
ÍÁÔ{]ãt^ÁÖ¦ãç^	Ú¦[b∿&oÁp`{à^¦K	RFH€FIÏÈEË/Ô060€Ú	Y[¦\ÁJ¦å^¦ÁÀkÁÁ FJ€GFGJ
ÙdĂÚæĭ∣ÊATÞÁÄLÍF€H	Ú¦[b∿&oÁTæ)æ*^¦h	(T¦ÈÄÜa&∖Áxaa)Á0E∥^}	Öæe^ÁÜ^][¦c∿åK €Î BFGBFJ

#### JC7<sup>·</sup>, &\*\$6<sup>·</sup>!'EiU']mi7cblfc` @[YbX'HYW]b]WU'GYfj]WYgz=bW

ĺŒjæĵ œ'	Ü^∙`  c	ÜŠ	ΤÖŠ	W}ãe∙	Ù] ã ^ Š^ç^∣	Ù[ ˘ ¦&^ Ü^∙ ˘  c	à ÜÒÔ	ÃÜÒÔ Šãįão•	à ÜÚÖ	à ÜÚÖ ŠãĮãc	Þ[ c∿∙Á
6 UHW(`6 - : \$' \$, `!`9 D5 `) \$' \$7 `K UHYf	"fDif[Y'UbX'H	fUdł⊥									
AUhf]l`Gd]_Y`f6-:\$'\$,!AG%L	G	cifWY.	`% <b>\$&amp;%&amp;-</b> !\$	%	Ú¦^]æ¦^å	NKÆÎÐEGEFJ	ÁKOB;æ†î:^å	akkéî <del>B€HDF</del> J	Á		
FÊGËÖãa¦[{[ЁНЁ&@[[¦[]];[];a})^	IÎĚ	GŤ	€ÈEÏÌ	ĭ∗Њ	IÏÈ€	ŁŒĚ	JJÈ€	ΪΙĚĖĒGG			
FÊEËÖãa¦[{ [^c@aa)^ÁÇÖÖÓD	II È	€È€	€È€FG	ĭ∗Њ	IÏÈ€	Ł€ÈĐ€	JIÈ	Ì€ËG€			
FÊGËÖ3&@[¦[à^}:^}^	II Ē	€Ľ€	€È€GH	ĭ∗Њ	IÏÈ€	Ł€Ě€	JIÈ	ΪÍËEGÍ			
FÊEËÖ&&@[¦[^c@ee)^	IGÈ	€ÈÍ	€È€GG	ĭ∗Њ	IÏÈ€	Ł€ÈGÍ	JFÈF	ΪÌÈÈËFGG			
FÊ£ËÖ&&@[¦[]¦[]æ}^	IÌÈ	FÈ€	€È€GÏ	ĭ∗Њ	IÏÈ€	ŁFÈ€	F€H	Ì€ËEG€			
FÊ÷HÉİËV¦ãį,^c@∥à^}:^}^	IÌÈ	FÈ€	€È€GÎ	ĭ∗Њ	IÏÈ€	ŁFÈ€	F€	Ì€ËFG€			
FÊHEÖ3&@{[¦[à^}:^}^	ΙÍÈ	FÈ€	€È€HÌ	ĭ∗Њ	IÏÈ€	ŁFÈ€	JÎĒ	ΪÍËEGÍ			
FÊHÊÖ&&@[¦[]¦[]æ}^	ΙÎÈΗ	FÈ€	€È€H	ĭ∗Њ	IÏÈ€	ŁFÈ€	JÌĒ	Ì€ËG€			
FÊLËÖ&&@{[¦[à^}:^}^	ΙΙÈ	FÈ€	€È€FJ	ĭ∗Њ	IÏÈ€	ŁFÈ€	JIĒ	ΪÍËEGÍ			
GÊEËĴ&@[ ¦[ ] ¦[ ] æ} ^	I GÊ	ÍÈ€	€È€	ĭ∗Њ	IÏÈ€	ŁÍÈ€	J€Ë	ÎÍÈËFI€			
GËĎĭæ}[}^	ÍFÈ	G€	€ÌHÏ	ĭ∗Њ	IÏÈ€	ŁŒ	FF€	ΪÍËEGÍ			
GËÔ@[¦[d[ ĭ^}^	IJĚ	FÈ€	€È€FÏ	ĭ∗Њ	IÏÈ€	ŁFÈ€	F€Í	ΪÍËEG			
IËÔ@[¦[d[ ˘^}^	LÌ ÈG	FÈ€	€È€HF	ĭ∗Њ	IÏÈ€	ŁFÈ€	F€G	ÏJĚËFG€			
Oæ∧₫}^	IÎĚ	G€	€ÈHG	ĭ∗Њ	IÏÈ€	ŁŒ	JJÈ€	ΪÍËEGÍ			
Ο⋕,` Á&@[[¦ãå^	ÍGÈÈ	ÍÈ€	€ÈEIG	ĭ∗Њ	IÏÈ€	ŁÍÈ€	FFG	ΪÍËEGF			
Ó^}:^}^	ΙΪĒĖ	€Ľ€	€È€FÍ	ĭ∗Њ	IÏÈ€	Ł€Ě€	F€F	Ì€ËG€			
Ó¦[{ [à^}:^}^	ШÈ	FÈ€	€È€GÏ	ĭ∗Њ	IÏÈ€	ŁFÈ€	JÍĒ	ÏÌÈËËG€			
Ó¦[{[&@][¦[{ ^c@ee})^	ÍFĚ	FÈ€	€È€HG	ĭ∗Њ	IÏÈ€	ŁFÈ€	FF€	ΪÍËEG€			
Ó¦[{[åã&@[[¦[{^c@æ}}^	lĺÈ€	FÈ€	€È€FÍ	ĭ∗Њ	IÏÈ€	ŁFÈ€	JÍÈ	Ì€ËG€			
Ó'[ { [ -{ ¦ {	١١Ĕ	ÍÈ€	€È€FÍ	ĭ∗Њ	IÏÈ€	ŁÍÈ€	JIĒ	ïÌËFGG			
Ó¦[{ [{ ^c@ee}}^	ÍŒÈ	GĚ	€ÈÉÍ€	ĭ∗Њ	IÏÈ€	ŁŒĚ	FFG	ΪÍËEΉ€			
Ôælà[}Áx^dæ&@{[¦ãã^	LÎ ÈG	€Ľ€	€È€GÏ	ĭ∗Њ	IÏÈ€	Ł€Ě€	JÌÈH	ÏJÈGËEG€			
Ô@[  [ à^} : ^} ^	ΙΙË	FÈ€	€ÈÉÎF	ĭ*Њ	IÏÈ€	ŁFÈ€	JÍÈG	Ì€ËFG€			
Ô@[ [^c@#}^	ÍÌÈG	GĚ	€ÈÉÎF	ĭ*Њ	IÏÈ€	ŁGĚ	FG	ÏÍËEGÌ			
Ô@{[  [ -{  {	IÌÈ€	FÈ€	€È€FH	ĭ*Њ	IÏÈ€	ŁFÈ€	F€G	Ì€ËFG€			
Ô@[ [{ ^o@ee}^	ÎGÈH	GĚ	€È€GÏ	ĭ*Њ	IÏÈ€	ŁGĚ	FHG	ÏFÈÈËFH€			ΤF
888 ËFÊEËÖ8&@{  ¦[^c@}}^	ÍFË	FÈ€	€È€GG	ĭ*Њ	IÏÈ€	FÈÎ	F€Î	Ì€ËFG€			
&ã Ё=Ê=EÖã&@{[ ¦[ ] ¦[ ] ^} ^	IÎÈE	€Ě€	€È€G	ĭ*Њ	IÏÈ€	Ł€Ě€	JÌÈE	Ì€ËFG€			
Öâa¦[{[&@{[¦[{ ^c@æ}}^^	ЦÈG	€Ě€	€È€GF	ĭ*Њ	IÏÈ€	Ł€Ě€	JIÈ€	Ì€ËFG€			
Öâa¦[{[{^c@aa}}^	ΙÍÈ	GŤ	€È€GÎ	č∗Њ	IÏÈ€	ŁŒĬ	JÏÈÈ	Ì€ËFG€			
Ö&&@{[¦[åã-]ĭ[{ ^c@æ)}^	lÎÈ	ÍÈ€	€È€H€	ĭ∗Њ	IÏÈ€	ŁÍÈ€	JÌĒ	Ï€ËEGÍ			
Ö&&@[¦[⊣ĭ[¦[{ ^cœe)}^	ÍÍÈ	FÈ€	€È€G	ĭ∗Њ	IÏÈ€	ŁFÈ€	FFJ	ΪÍËEΉ€			
Òc@  Á\c@ ¦	ÍGĚ	ÍÈ€	€È€H€	ĭ*Њ	IÏÈ€	ŁÍÈ€	FFG	Ì€ËFG€			
Òc@ à^}:^}^	lÎÈÈ	FÈ€	€È€GF	ĭ*Њ	IÏÈ€	ŁFÈ€	JJĚ	Ì€ËEG€			
P^¢æ&@{[¦[àĭæåå}}^	HÈ€	GŤ	€ÈG	ĭ*Њ	IÏÈ€	ŁŒĚ	ΪΙĒ	Ï€ËH€			
@[]¦[]^ à^}:^}^	IJÈH	FÈ€	€È€FJ	ĭ*Њ	IÏÈ€	ŁFÈ€	F€Í	ÏÏÈËFG€			
{ ĜĔ^^/}	JHÈ€	GÈ€	€ÈEIÍ	č∗EŠ	JIÈ€	ŁŒÈ€	JÌÈ	ÏJÈËFŒ			
T^o@ Áai[àčĉ Áĺ^q[}^	IJÈ	ÍÈ€	€ÈÈÌG	ĭ*Њ	IÏÈ€	ŁÍÈ€	F€	Ì€ËFG€			
T^c@/Áe^¦dääčcî/Árc@-¦	ÍGÈH	FÈ€	€Ì€Í€	ĭ∗Њ	IÏÈ€	ŁFÈ€	FFF	Ì€ËG€			

Š^\*^}åÁ/^&@/3&aa†ÁÙ^¦ç3&^•ÉAQ&È



ÓæÎÁ∕^∙c	Ú¦[b%&cK	OEjæ†r ca8æa†ÁÙ^¦ça8∧∙	
ÍÁÒ{]ãi^ÁÖ¦ãç^	Ú¦[b∿&oÁp`{à^¦K	RFH€FIÏÈEË/Ô060€Ú	Y[¦\ÁJ¦å^¦ÁÄkKÁ FJ€GFGJ
ÙdĂÚæĭ∣ÉATÞÁÍÁÍF€H	Ú¦[b∿&oÁTæ)æ*^¦∤	<⊤¦ÈÄÜæ3∖ÁXæa)ÁΩ≣ ^}	Öæe^ÁÜ^][¦c∿åK €Î BFGBFJ

#### JC7 ', &\* \$6 '!'Ei U']hm7 cblfc` @[ YbX'HYW[ b]WU'GYfj]W¥gž=bW

ĺŒjæf`¢^	Ü^∙`∣c	ÜŠ	ΤÖŠ	W}ãe∙	Ù] ã ^ Š^ç^∣	Ù[ ˘¦&^ Ü^∙˘ c	à ÜÒÔ	à ÜÒÔ Šãįãoo	à ÜÚÖ	à ÜÚÖ Šãįãc	Þ[ ♂∙Á
- 6UHWI`6-:\$'\$,`!`9D5`)\$'\$7`KUHYf`fE	Dif[Y'UbX'H	fUdŁ									
A Uhf1  `Gd1 Y`f6-:\$'\$.!A G%L	G	cifWY.	% \$&%&- !\$	%	Ú¦^1æ¦^å	kÆÎ BEGEFJ	ÁKOElælî:^å	akkéî <del>B€HDF</del> J	Á		
T^œ[^}^ <b>&amp;</b> @[¦ãa^	ΙÍÈ	GŤ	€È€	Ť*Њ	IÏÈ€	ŁŒĚ	JÏĚ	ïìÈËFG€			
Þæ]@@æ/}^	I FÈF	ÍÈ€	€È€HÍ	ĭ∗Њ	IÏÈ€	ŁÍÈ€	ÌÏĚ	Ï€ËEGÍ			
} ËÖ` ĉ  à^} : ^} ^	IJÈ	GĚ	€È€IÍ	č∗EŠŠ	IÏÈ€	ŁŒĚ	F€Í	ΪÍËEGÍ			
} ËĴ¦[]^ à^}:^}^	̀Ȁ	FÈ€	€È€HF	č∗ĐŠ	IÏÈ€	ŁFÈ€	F€Î	ÏÏÈËFG€			
[ĔY^ ^}^	lÎÈ	FÈ€	€È€FÍ	č∗ĐŠ	IÏÈ€	ŁFÈ€	JJĔ	Ì€ËFG€			
] Ë@[ ] ¦[ ] ^  d[  ˘ ^} ^	IÌĒ	GĚ	€È€GF	č∗ĐŠ	IÏÈ€	ŁGĚ	F€H	ΪÍËEGÍ			
•^&ËĎčć à^}:^}^	IJĒ	FÈ€	€È€GÍ	č*ĐŠ	IΪÈ€	ŁFÈ€	F€Î	ΪÍËEGÍ			
Ùĉ ¦^} ^	ΙÍĖΪ	FÈ€	€È€GF	ĭ∗Њ	IÏÈ€	ŁFÈ€	JÏÈH	̀ˌ			
c^¦dĐ̃` ĉ  à^}:^}^	l) È	FÈ€	€ÈEHH	ĭ∗Њ	IÏÈ€	ŁFÈ€	F€	ïìÈËFG€			
V^dæ&@{[¦[^c@}}^	ΙÍÈG	FÈ€	€È€GÎ	ĭ∗Њ	IÏÈ€	ŁFÈ€	JÎÈE	Ì€ËFG€			
V^dæ@å¦[~`¦æ)	ÍÍÈ	G€	€È€	ĭ∗Њ	IΪÈ€	ŁŒ	FFÌ	ΪÍËEGÍ			
V[  ~ ^} ^	ΙΪÈG	FÈ€	€È€FH	č∗EŠ	IΪÈ€	ŁFÈ€	F€€	Ì€ËFŒ			
dæ <b>)•ЁÊÊÊÖ&amp;@</b> [¦[^c@}}^	Í€ÈG	FÈ€	€ÈÉÍ€	č∗EŠ	IΪÈ€	ŁFÈ€	F€Ï	Ì€ËFŒ			
dæ)•ËFÊ+EÖ&&@[¦[]¦[]^}^	١١Ě	€Ě€	€È€FH	č∗EŠŠ	IÏÈ€	Ł€Ě€	JIË	Ì€ËFŒ			
V:a&@[: [^c@}}^	ΙÍÈ	€Ě€	€È€GÎ	č∗Њ	IÏÈ€	Ł€Ě€	JÏÈ	Ì€ËG€			
V:a&@[¦[- ˜[¦[{ ^c@ee})^	IJÈ	FÈ€	€ÈG	č∗EŠ	IÏÈ€	ŁFÈ€	F€Î	ÏGÈÈËH€			
Xậ ^  Á&@[[¦ãå^	ÍJË	€ÈÉÍ€	€È€FH	č∗Њ	IÏÈ€	Ł€ÈÉÍ€	FĠ	ΪÍËFH€			
Surrogate: 4-Bromofluorobenzene	49.0			ug/L	46.6		105	80-120			
Surrogate: Dibromofluoromethane	44.7			ug/L	46.6		95.9	80-120			
Surrogate: Toluene-d8	47.1			ug/L	46.6		101	80-120			
AUhf]l`Gd]_Y`8id`f6-:\$'\$,!AG8%L	G	cifWY.	% \$&%&- !\$	%	Ú¦^] æ¦^å	lKÆÎÐEGÐFJ	ÁKOB;æ∳î:^å	åkÆÎ <del>B€HDF</del> J	Á		
FÊFÊFÊBË/^dæ&@[¦[^c@ee)^	IHÈ	FÈ€	€È€H	č*EŠŠ	IÏÈ€	ŁFÈ€	JHÈH	Ì€ËFG€	€ÈŒF	G€	
FÊFÊFË/¦&&@{[¦[^c@eee)^	ΙÎĒ	FÈ€	€ÈEIG	č∗Њ	IÏÈ€	ŁFÈ€	IJÈG	Ì€ËFG€	€ÌĒEHÏÍ	G€	
FÊFÊGÊGËK/\\$&&@[¦[^0@e)^	ÍGÈ€	€Ě€	€È€FÌ	ĭ*Њ	IÏÈ€	Ł€Ě€	FFF	ΪÍËΕΏ	€ÈÏG	G€	
FÊFÊGËV¦&&@{{ {^c@e}}^	ΙΪĚ	€Ě€	€È€FÌ	ĭ*Њ	IΪÈ€	Ł€Ě€	F€F	Ì€ËFG€	€ÈGÏF	G€	
FÊ=ÊQËV¦3&@{[¦[dã ǐ[¦ ^o@æ)^	II È	FÈ€	€ÈEHH	ĭ*Њ	IΪÈ€	ŁFÈ€	JÍĒ	ÏÍÈÈËG€	FÈ€Í	G€	
FÊFEÖ&&@[  [ ^c@e) ^	ÍGÈÈ	FÈ€	€È€F€	ĭ∗Њ	IÏÈ€	ŁFÈ€	FFG	Ì€ËFŒ	GÈĐ€	G€	
FÊFËÖ&&@{{  { ^c@}} ^	ÍÏÈE	FÈ€	€È€FÌ	ĭ∗Њ	IÏÈ€	ŁFÈ€	FGG	Ì€ËG€	HÈ€H	G€	ΤF
FÊFËÖ&&@[ ¦[ ] ¦[ ] ^} ^	ÍGÈH	FÈ€	€È€CÌ	ĭ∗Њ	IÏÈ€	ŁFÈ€	FFF	Ì€ËFŒ	HÈ€H	G€	
FÊGÊÉÉV¦a&@{[¦[à^}:^}^	ΗÊ	ÍÈ€	€ÈÉÎH	ĭ∗Њ	IÏÈ€	ŁÍÈ€	ΪÎÈ	Ï€ËH€	HÈÈÌ	GÍ	
FÊGÊHËV¦&&@{[¦[]¦[]æ}^	IJÈG	€È€	€È€HH	ĭ∗Њ	IÏÈ€	Ł€ÈĐ€	F€Í	ΪÍËFGG	FÈÎ	G€	
FÊGÊÊËV¦\$&@{[¦[à^}:^}^	HÎĚ	FÈ€	€È€IJ	č∗EŠ	IΪÈ€	ŁFÈ€	ΪΪĖΪ	Ï€ËH€	CHÉCÌ	GÍ	
FÊGÊÊËV¦ã[^c@ à^}:^}^	IÌÈ	FÈ€	€È€GG	ĭ*Њ	IÏÈ€	ŁFÈ€	F€	Ì€ËFG€	€ÈÉÍI	G€	
FÊGËÖãa¦[{[ËHË&@[¦[]¦[]æ}}^	IÌÈ	GĚ	€ÈEÏÌ	č*ĐŠ	IÏÈ€	ŁŒĚ	F€H	ΪΙĚĖËFGG	IÈ€€	G€	
FÊEËDãa¦[{ [^c@ee)^ÁÇDOOD	ШÈН	€È€€	€È€FG	ĭ*Њ	IΪÈ€	Ł€ÈĐ€	JIÈG	Ì€ËG€	€ÈH	G€	
FÊBËÖ&&@{[ ¦[ à^} : ^} ^	ΙΙÈ	€Ě€	€È€GH	ĭ∗Њ	IÏÈ€	Ł€Ě€	JÍÈ	ΪÍËEGÍ	€ĒÌ́H	G€	
FÊEËD&@{[  [ ^c@#) ^	IGĒ	€ÈĴ	€È€GG	ĭ∗Њ	IÏÈ€	Ł€ÈGÍ	J€Ē	ïÌÈÈËFGG	€ŤJG	G€	
FÊEËÖ&&@[ ¦[ ] ¦[ ] æ}^	IÌĒ	FÈ€	€È€CÏ	č*EŠŠ	IΪÈ€	ŁFÈ€	F€H	Ì€ËFŒ	€ÈFÏ	G€	
FÊHÉËË/¦ã[^c@ à^}:^}^	IJÈG	FÈ€	€Ì€GÎ	č∗Њ	IÏÈ€	ŁFÈ€	F€Í	Ì€ËFG€	€ĚÍÌ	G€	

Š^\*^}åÁ/^&@/3&aa†ÁÙ^¦ç3&^•ÉAQ&È



Óæ Á∕ ^∙c	Ú¦[b%&cK	OEjæ†îca8æa†ÁÙ^¦ça8∧∙	
ÍÁÒ{]ãi^ÁÖ¦ãç^	Ú¦[b∿&oÁÞ`{à^¦K	RFH€FIÏÈEË/Ô060€Ú	Y[¦\ÁJ¦å^¦ÁÀKÁÁ FJ€GFGJ
ÙdĂÚæĭ∣ÉATÞÁÍÁÍF€H	Ú¦[b∿&oÁTæ)æ*^¦∤	<⊤¦ÈÄÜæλ∖ÁΧæ)•ÁΩЩ^}	Öæe^ÁÜ^][¦c∿åK €Î BFGBFJ

#### JC7 ', &\* \$6 '!'Ei U']hm7 cblfc` @[ YbX'HYW[ b]WU'GYfj]WVgž=bW

ÁCE æ^ ¢	Ü^∙` c	ÜŠ	ΤÖŠ	W∤ão•	Ù] ã ^ Š^ç^∣	Ù[ ˘¦&^ Ü^∙˘∣c	à ÜÒÔ	ÃÜÒÔ Šã[ão•	à ÜÚÖ	à ÜÚÖ Šã[ãc	Þ[ c∿∙Á
6 UHW(`6-:\$'\$,`!`9 D5`)\$'\$7`K UHYf`fl	Dif[Y'UbX'H	UdŁ									-
A Uhf1l `Gd1 Y`8id`f6-:\$'\$.!A G8%L	- G	cifWY.	·% \$&%&- !\$	%	Ú¦^1æ¦^å	KÆĴÆEGÆFJ	ÁKOBEade^:^á	akkéî <del>n⊛⊣op</del> j	Á		
FÊHÊÖ&&@[ ¦[ à^} : ^} ^	LÎ ÈH	FÈ€	€ÈEHÌ	`*Њ	lïÈ€	ŁFÈ€	JÌĚ	ïíË∓ɗ	FÈH	G€	
FÊHÊÖ&&@[¦[]¦[]æ]^	ΙÎΈΕ	FÈ€	€È€H	ĭ*Њ	IÏÈ€	ŁFÈ€	JÌÈ€	Ì€ËFG€	€ŤJÏ	G€	
FÊEËDä&@{  {  à^} : ^} ^	ΙĹΈΕ	FÈ€	€È€FJ	č∗ĐŠ	IÏÈ€	ŁFÈ€	JÎÈ€	ΪÍËEGÍ	FÈÎ	G€	
£££58\$@[¦[]¦[]æ}^	I FĚ	ĺÈ€	€È€	č∗EŠŠ	IÏÈ€	ŁÍÈ€	ÌÌÈ	ÎÍÈËEI€	GÊ€	G€	
GËŬ œ}[}^	ÍIĒ	G€	€ÌHÏ	č*ĐŠ	IÏÈ€	ŁG€	FFÎ	ΪÍËEGÍ	íÈEÎ	G€	
GËÔ@[[¦[d[ĭ^}^	IJĔ	FÈ€	€È€FÏ	č∗ĐŠ	IÏÈ€	ŁFÈ€	F€Î	ΪÍËEG	€ÈGIJ	G€	
IËÔ@{[¦[d[ ˘^}^	IÌÈH	FÈ€	€ÈEHF	ĭ∗Њ	IÏÈ€	ŁFÈ€	F€H	ÏJĚËFŒ	€ÈCÌÎ	G€	
OB2^{{}}^{{}}^{{}}^{{}}^{{}}^{{}}^{{}}	ÍŒEG	G€	€ÈHG	č∗EŠ	IÏÈ€	ŁŒ	FFF	ΪÍËEGÍ	FFĒ	GÍ	
Q≣,  Á&@[[¦ãã^	ÍHÈÈ	ĺÈ€	€ÈEIG	č∗EŠŠ	IÏÈ€	ŁĺÈ€	FFI	ΪĺËΕGF	FÈH	G€	
Ó^}:^}^	ΙΪĖĖ	€Ě€	€Ì€FÍ	č∗Њ	IÏÈ€	Ł€Ě€	F€G	Ì€ËG€	€Ě€Î	G€	
Ó¦[{ [à^}:^}^	ΙÍË	FÈ€	€È€GÏ	č∗EŠŠ	IÏÈ€	ŁFÈ€	JÏÈĒ	ÏÌÈËËG€	FÈF	G€	
Ó¦[{[&@][¦[{ ^c@ee}}^	ÍHÈÈ	FÈ€	€È€HG	č∗EŠŠ	IÏÈ€	ŁFÈ€	FFI	ΪÍËEG€	HĚÍ	G€	
Ó¦[{[åã&@[ [{ ^c@æ)}^	ΠÈ	FÈ€	€Ì€FÍ	č∗Њ	IÏÈ€	ŁFÈ€	JÍĚ	Ì€ËG€	€ÌH€I	G€	
Ó'[ { [ -{ ¦ {	ΙHĒ	ÍÈ€	€È€FÍ	č*ĐŠ	IÏÈ€	ŁÍÈ€	JGË	ïÌËFGG	FÈÏ	G€	
Ó¦[{ [{ ^o@ee}}^	ÍGÈ	GĚ	€ÈÉÍ€	ĭ*Њ	IΪÈ€	ŁŒĚ	FFG	ΪÍËΕΉ€	€Ť FI	G€	
Ôælà[}Áx^dæ&@{[¦ãa^	ΙÎÈ	€Ě€	€È€GÏ	ĭ*Њ	IΪÈ€	Ł€Ě€	JÌĒ	ÏJÈÐËFG€	€ÈĤG	G€	
Ô@[	ΙΙË	FÈ€	€ÈÉÎF	ĭ*Њ	IΪÈ€	ŁFÈ€	JÍÈ	̀ˌ	€È€FFG	G€	
Ô@[ [^cœee)^	ĺÌĒ	GĚ	€È€ÎF	ĭ∗Њ	IÏÈ€	ŁŒĚ	FGÍ	ÏÍËEGÌ	€ÈHG	G€	
Ô@[  [ -{  {	ΙÌË	FÈ€	€È€FH	ĭ*Њ	IΪÈ€	ŁFÈ€	F€	Ì€ËG€	FÈ€	G€	
Ô@[ [{ ^o@e}^	ÎIÈ	GĚ	€È€CÏ	ĭ*Њ	IΪÈ€	ŁŒĚ	FHÏ	Ï FÈËFH€	HÈHÏ	ď	ΤF
&# ËFÊEËÖ&&@{{ ¦[ ^c@}} ^	ÍHÈG	FÈ€	€È€CG	č*EŠŠ	IÏÈ€	FÈÎ	F€J	̀ˌ	GÈIF	G€	
&ã ЁÊÊÊÖ&&@{[ ¦[ ] ¦[ ] ^} ^	lî È	€Ě€	€È€G	č∗Њ	IÏÈ€	Ł€Ě€	JÌÈ€	̀ˌ	€ÈGF	G€	
Öâa¦[{[&@{[¦[{ ^c@æ∳ ^	ΙΙÈ	€Ě€	€È€GF	ĭ*Њ	IÏÈ€	Ł€Ě€	JÍÈ	̀ˌ	FĚ€	G€	
Öââ¦[{ [{ ^o@ee}}^	lÎÈ€	GŤ	€Ì€GÎ	ĭ*Њ	IÏÈ€	ŁŒĚ	JÌÈ€	Ì€ËG€	€ÈFI	G€	
Öa&@{[¦[åã∔ĭ[¦[{ ^c@æ)}^	ПÈ	ÍÈ€	€Ì€H€	ĭ*Њ	IÏÈ€	ŁÍÈ€	JIÈH	Ï€ËEGÍ	ΙĚÍ	G€	
Ö&&@{[¦[⊣ĭ[{ ^c@æ})^	ÍÏÈG	FÈ€	€È€G	ĭ*Њ	IΪÈ€	ŁFÈ€	FGG	ΪÍËFH€	GÈGJ	G€	
Òc@ Ác@¦	ÍŒÈ	ÍÈE	€È€H€	ĭ∗Њ	IÏÈ€	ŁĺÈ€	FFG	Ì€ËG€	€ÈËÏF	G€	
Òc@ à^}:^}^	ΙÎĒ	FÈ€	€È€GF	ĭ∗Њ	IÏÈ€	ŁFÈ€	IJÈG	Ì€ËG€	€ÈĤF	G€	
P^¢æ&@{[¦[àĭæåå}}^	HÎÈ	GĚ	€ÈG	ĭ∗Њ	IÏÈ€	ŁŒĚ	ΪÌĚ	Ï€ËH€	ĺÈÌ	GÍ	
@[]¦[]^ à^}:^}^	IJĒ	FÈ€	€È€FJ	ĭ∗Њ	IÏÈ€	ŁFÈ€	F€Î	ÏÏÈËFG€	€ËIG	G€	
{	JFĒ	GÈ€	€ÈEIÍ	ĭ*Њ	JIÈ€	ŁGÈ€	JÏÈ	ÏJÈËFŒ	FĚ F	G€	
T^c@∥Áær[àčć∥Á^d[}^	Í€È	ÍÈE	€ÈÈÌG	č*Њ	IÏÈ€	ŁĺÈ€	F€Ï	Ì€ËG€	GÈ€F	G€	
T^c@ Á&^¦däačć Á*c@}¦	ÍHÈH	FÈ€	€ÈÉÍ€	č*ĐŠ	IÏÈ€	ŁFÈ€	FFH	̀ˌ	FÈLJ	G€	
T^c@ ^}^ <b>Á&amp;@</b> [¦ãå^	ΙΪĖ	GĚ	€È€	č*EŠŠ	IÏÈ€	ŁŒĚ	F€F	ÏÌÈËG€	HÈGÌ	G€	
Þæ]@@æ ^}^	IHÈ€	ĺÈ€	€È€HÍ	č*EŠ	lΪÈ€	ŁĺÈ€	JFĚ	Ï€ËG	IĚÍ	GGÈ	
} ÊD` c^  à^} : ^} ^	IJÈ	GĚ	€ÈEIÍ	č*EŠ	lΪÈ€	ŁŒĚ	F€	ΪÍËEGÍ	€ÈÈÌÍ	G€	
} ËÜ;[]^ à^}:^}^	IJÈ	FÈ€	€ÈEF	č*EŠ	lΪÈ€	ŁFÈ€	F€Î	ĨĨÈËFG€	€ÈFH	G€	
[ ĔY^  ^ } ^	ΙĺÈ	FÈ€	€È€FÍ	č*EŠ	lΪÈ€	ŁFÈ€	JÏĖĖ	̀ˌ	FËÏ	G€	
] ËQ[] ¦[] ^  d[  ` ^} ^	١JÈ	GĚ	€È€GF	ĭ∗Њ	IÏÈ€	ŁŒĚ	F€	ΪÍËΕΏ	€ÈÍH	G€	

Š^\*^}åÁ/^&@/3&aa†ÁÙ^¦ç3&^•ÉAQ&È



ÓæÎÁ∕^∙c	Ú¦[b%&cK	OEjæ†îca8æa†ÂÛ^¦ça8∧∙	
ÍÁÔ{]ãt^ÁÖ¦ãç^	Ú¦[b∿&oÁp`{à^¦K	RFH€FIÏÈEË/Ô0E0EÚ	Y[¦\ÁJ¦å^¦ÁÀkÁÁFJ€GFGJ
ÙdĂÚæĭ∣ÊATÞÁÄ⊾ÍF€H	Ú¦[b∿&oÁTæ)æ*^¦h	<⊤¦ÈÄÜæ3∖Áxæ),ÁΩ≣ ^}	Öæe^ÁÜ^][¦c∿åK €Î ⊞FGBFJ

#### JC7`, &\* \$6`!`EiU]hm7cblfc` @{[YbX`HYW{b]WU`GYfj]W¥gž=bW

€05 æ° ¢	Ü^∙`  c	ÜŠ	ΤÖŠ	W}ãœ	Ù] ã ^ Š^ç^	Ù[ ˘¦&^ Ü^∙˘ c	à ÜÒÔ	à ÜÒÔ Šãįãor	à ÜÚÖ	à ÜÚÖ Šąįãc	Þ[ c^∙Á
6 UHW(`6-:\$'\$,`!`9 D5`)\$'\$7`K UHYf`fDif[Y`UbX`HFUdŁ											
A Uhf]I `Gd]_Y`8 i d`f6 - : \$' \$, !A G8 %L	G	cifWY.	% \$&%&- !\$	%	Ú¦^]æl^åkké⊟ BecoerrJÁKOB;æl;`:^åkké⊟ Be⊟BrrJÁ						
•^&ËĎ`č  à^}:^}^	IJÈ	FÈ€	€È€GÍ	ĭ∗Њ	IÏÈ€	ŁFÈ€	F€I	ΪÍËEGÍ	FÈ€J	G€	
Ùĉ ¦^} ^	IÍÈ€	FÈ€	€È€GF	ĭ∗Њ	IÏÈ€	ŁFÈ€	JÍÈ	Ì€ËG€	FÊH	G€	
ơ∿¦dĐ̃` cˆ  à^} : ^} ^	IÌË	FÈ€	€ÈEHH	ĭ∗Њ	IÏÈ€	ŁFÈ€	F€I	ÏÌÈËFG€	€ÈËG G	G€	
V^dæ&@[¦[^c@}}^	ΙÍÈΗ	FÈ€	€È€GÎ	ĭ∗Њ	IÏÈ€	ŁFÈ€	JÎÈH	Ì€ËFG€	€ÈËÏI	G€	
V^dæ@å¦[~`¦æ)	ÍÏÈG	G€	€È€	ĭ∗Њ	IÏÈ€	ŁŒ	FGG	ΪÍËEGÍ	GÈH	G€	
V[  ~ ^} ^	ΙΪÈ	FÈ€	€È€FH	ĭ∗Њ	IÏÈ€	ŁFÈ€	F€G	Ì€ËFG€	FĔ€	G€	
daa)●ËFÊEËÖ&&@{[¦[^c@}}^	ÍŒĚ	FÈ€	€ÈÉÍ€	ĭ∗Њ	IÏÈ€	ŁFÈ€	FFG	Ì€ËFG€	IÈHÍ	G€	
dæ)•Ë=Ê=ĒEÖ&&@[¦[]¦[]^}^	ΙIÈ	€Ě€	€È€FH	ĭ∗Њ	IÏÈ€	Ł€ĽĚ€	JÍĚ	Ì€ËFG€	€ÈGH	G€	
V¦&&@[¦[^c@}}^	ΙÎÈ	€Ě€	€È€GÎ	ĭ∗Њ	IÏÈ€	Ł€ĽĚ€	JJË	Ì€ËFG€	GÌHÌ	G€	
V¦a&@{[¦[- ĭ[ { ^c@ee})^	Í€Ē	FÈ€	€ÈG	ĭ∗Њ	IÏÈ€	ŁFÈ€	F€Ì	ÏGÈÌËFH€	FÈF	G€	
Xậĵ^ Á&@{[¦ãã∧	ÎFÈ	€ÈÉÍ€	€È€FH	ĭ*Њ	IÏÈ€	Ł€ÈÉÍ€	FHF	ÏÍËFH€	GËI	G€	ΤF
Surrogate: 4-Bromofluorobenzene	48.4			ug/L	46.6		104	80-120			
Surrogate: Dibromofluoromethane	43.6			ug/L	46.6		93.5	80-120			
Surrogate: Toluene-d8	46.7			ug/L	46.6		100	80-120			



ÌÌÂÔ{]ã^^AÔ¦ãç^ ÙAÚæĭ|ĔTÞÁĨÍF€H V^|KAĨÍFĒIIGË∓FÍ€ ØægKAĨÍFĒIIGË∓GHJ

ÓæÎÁY ^∙c	Ú¦[b/&dK	OEjæ†îca&æ4ÁÜ^¦ça&∧∙	
ÍÁÖ{]ã~ÁÖ¦ãç^	Ú¦[b∿&o4p°{à^¦K	RFHEFIÏ ÈFË/ÔOEDEÚ	Y[¦\ÁJ¦å^¦ÂÀKÁ FJ€GFGJ
ÙdĂÚæĕ∣ÊĂTÞÁÄÍÍF€H	Ú¦[b∿&oÁTæ)æ*^¦h	(T¦ÈÄÜa&∖Áxæ),ÁΩЩ^}	Öæe^ÁÜ^][¦c^åK €Î⊞FGBFJ

#### BchYg'UbX'8 YZjb]hjcbg'

- TF Tæd ã¢Á jã ^Á^&[ç^¦^Á, æ Á@ã @Êx@ Áse •[&ãæe ^å/å|æ) \Ájã ^Á^&[ç^¦^Á, æ Ás&&^]cæà|^È
- Ł Š^••Áx@ee)Áşæeĭ^Ájærc^å
- å¦î Ùæ{]|^Á^•ĭ|œÁ^][¦ơàÁţ}Âźazáå¦^Á,^ãt@zÁazerãa
- ÞCE Þ[oÁse]] / 83æaa / ÞÉÁ / @ ÁÃ Ü Ú Ö Áser Á, [oÁsæeks" / æe\* å Á+[{ Áçæ \* ^• Á ^•• Ás@æ), Ás@ Á ^] [ ¦ cij \* Ájā í átÈ
- $T \ddot{O} \dot{S} T \land c @ a \dot{A} \ddot{O} \land c \land 8 c a i \} \dot{A} \ddot{S} \ddot{a} i a \dot{A} \dot{A} \dot{O} \dot{V} \dot{a} c a a \dot{A} \dot{S} U \ddot{O} \dot{A} \dot{S} \ddot{S} \ddot{a} i a \dot{A} \dot{A} \dot{O} \land c \land 8 c a i \} D$
- ÜŠ Ü^][¦cāj\*ÁŠā[ãc
- ÜÚÖ Ü^|æaāç^ÁÚ^¦&^} ơЮã-^¦^} &^
- TÙ Tælá¢ÁÚ]ã.^ÁMÁŠæà[¦æq[¦^Á2[¦cãa?\åÁTælá¢ÁÇŠ2/TD



Page _	of	LEGEND 1 88 Empire Drive, St. Paul, MN 58 CHA	TECHNI 5103 - IN-OF-C	CA Tele CUS	L SERV ephone: TODY F	ICES, 651-6 RECOI	INC 342- RD	: 1150,	Fax: 65	1-642	2-1239							
Client N	lame: PAN . Fre	Bill To: Acoto Peoble			LEGEND	Project	#:   C	1021	29	coc	/Sample	Comm	ents:					
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Attn:	RICK VAN ALLEN	PO#:				Received on ice							AN	ALYSIS	3			
Phone:	651-291-3441	E-mail: RICK V BBAY WE	ST, сол	Received on ice pack     Received on melt water     Received ambient					r of iers	19/					Major Sample			
Project N	lame: TLAAP	Project#: J130147	Project#: J130197-						umbe	137				i	(5 greatest,			
ltem No.	Sam	ple Name	Name grad de S					Sample Matrix	Lab ID No.	Σŭ	VPC					hazardous)		
1	ONREID		x		5-29-19	1145	-	ATER	NAC	l I	3					1.1		
2	OWRLID-D		X		1	1200			R1		3							
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4	OURCAS		x			150.	5		N		3					1		
5	DIVRUSD		x			163	5	e/	51		3	Ч.	1					
6	TRIP BLANK		x		V	680	0 4	ATER	ale P		1							
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Sample (	Collector (please print): RICK SLEENEY	Relinquished By:			Date:	11	lime: Df	22	Accepted	by:				Date:		Time:		
Commen	Is	Relinquishet By:			Date:	1	lime:		Received	by Lab:	16.	a.	1	Date:	01	Time:		

#### 5 ddYbX]l '; "

## AU]bhYbUbWY/5W1jj]h]Ygʻ6mi@cWUh]cb :]gWUʻMYUF`&\$% H;FGžCI& 5fXYb`<]`gžA]bbYgchU

- GBOEÎ EDGEFJ V¦^æat{ ^}cÁ\`•c^{ÈČOÔXÁHÁ; [`|åÁ;[cÁ&|[•^Á;}Á&[{ æ);åĚÜ^{ [ç^åÁæ);åÁ^]|æ&A^åÁ ][¦cāį}•Á;~Ác@Á&[}d[|Á;ājā;\*ĚV´¦}^åÁÚ`{]ÁHÁ;}Áæ);åÁ^¢^¦&æi^àÁc@Áçæ¢ç^Á;^ç^¦æ¢Á cãį ^•ÈŹv@Áçæ¢ç^Á&[[•^åÁ;[¦{æ||`ĚÁ
  - Ö[,}Áxã[^KáÞ[}^È
- HÐÎ BÐÆFJ V¦^æa{ ^} cÅ{ È EÓÔXÁ Á, æ Á&[[•ā]\*Á|[,|^È EÔc^¦&æ^å&@ Á&[}d[|Áşa‡ç^•Á;} Ás@Á &[}d[|Á;a]ā]\*Áæ)åÁ^{ [ç^å Áæ)åÁ&[^æ)^åÁs@ Á&@ & Áşæ‡ç^•Á;} Ás@Á&[}d[|Á;a]ā]\*È Ö[, }Áaã] ^Káp[}^È
- HĐ ĐĐ€FJ V¦^æa{ ^} ơÂU^•ơ^{ ĚÔÔXÁHÁ [č|åÁ][ơ&|[•^Áæ||Ás@Á, æ ĚÂÜ^{ [ç^å/æa)}å/&a)^å/á@Á &@& Áşædç^•Áæ) å/A\*¢^¦&ãr^å/Ás@A&[}d[|Áşædç^•Áæ) å/ás@Aşædç^/&i[å^È ör ) Áz () 4 [c) 4 [c) 4 [c)

Ö[,}Áxã[^Ká⊅[}^È

- HBFÌ BB€FJ V¦^ææ{^}ôÂU`∙ơ{ ĚV@ Á&[ậÁ;}Ás@ Á\*{^¦\*^}& ^Á[|^}[ãâÁşæ¢ÔÔXÁ!Á,æ Ás`::ā]\*ĚÁ Ü^{ [ç^åÁsa)åÁ^]|æ&^åÁs@ Á\*[|^}[ãáÁşæ¢ç^Ási[å^Ása)åÁ&[ậÈ Ö[,}Ásā]^Káp[}^È
- ÏÐHBGEFJ V¦^ææ{ ^}ÓÙ`•ơ{ ĚÓ@æ) \*^åÁs@á{ā/ājÁjÁÚ`{]Á ĚV`¦}^å4[,~Á ^||•ÁÓÎ Áse) åÁÓJÁ{[Á {ājā[ã^Á, ^||Áa>|åÁsî &|ā] \*Á ão@át}|^ÁÚ`{]Á+Át]^¦ææā] \* ĔÁ2[||[],ā] \* Ás@Á [¦\Éá^•œæ!ơåÁ Ú`{]Á Áse) åÁtà•^¦ç^åÁ,[¦{æ4Át]^¦ææā]}ÈÁV`¦}^åÁÓÎ Áse) åÁÓJÁsaæ&\Át}Á{[¦Á,[¦{æ4Á [1 ^!∞∞attÈ Ö[],}Áaā] ^ KáCÁQ2`¦•Á %æ&@ÁsæAÓĴÁse) åÁÓJ
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# **APPENDIX H**

Site K and TGRS Operational Data



# Inspection and Maintenance Activities Fiscal Year 2019 Site K, OU2 Arden Hills, Minnesota

## October 2018

10/2/2018	Increased the influent flow rate. Down time: None
10/6/2018	Increased the influent flow rate. Down time: None
10/10/2018	Increased the influent flow rate. Down time: None
10/16/2018	Increased the influent flow rate. Down time: None
10/22/2018	Increased the influent flow rate. Down time: None
10/23/2018	The system was off upon arrival and the high/high water level alarm light was lit. Reset the PLC and restarted the system. Exercised the influent and effluent flow control valves and reset their flow rates.
	Down time: 24.5 hours.
10/24/2018	Increased the influent flow rate. Down time: None
10/26/2018	Increased the influent flow rate. Down time: None
10/28/2018	Increased the influent flow rate. Down time: None
10/30/2018	Increased the influent flow rate. Down time: None

# Inspection and Maintenance Activities Fiscal Year 2019 Site K, OU2 Arden Hills, Minnesota

## November

11/1/2018	Increased the influent flow rate.
	Down time: None.
11/2/2018	Increased the influent flow rate.
	Down time: None.
11/3/2018	Decreased the influent flow rate and increased the effluent flow rate.
	Down time: None.
11/5/2018	Increased the influent flow rate.
	Down time: None.
11/6/2018	Increased the effluent flow rate.
	Down time: None.
11/13/2018	Increased the influent flow rate.
	Down time: None.
11/20/2018	Increased the influent flow rate.
	Down time: None.
11/22/2018	Thanksgiving Day holiday. The daily inspection was not performed. Meter readings were
	Down time: None.
11/24/2018	Increased the offluent flow rate
11/24/2010	Down time: None.
December	
12/2/2018	The system was off on arrival. The air strinner high high water level light was on. Reset t

12/2/2018 The system was off on arrival. The air stripper high high water level light was on. Reset the PLC and restarted the system. Exercised and reset the influent and effluent flow rates. Normal operation observed.

Down time: 15 hours.

# Inspection and Maintenance Activities Fiscal Year 2019 Site K, OU2 Arden Hills, Minnesota

## December

12/3/2018 The system was off on arrival and the air stripper high high water level light was on. Flushed the treatment system, exercised the influent and effluent control valves and reduced the airflow rate slightly. The sump level remained difficult to set.

Down time: 27.5 hours.

12/4/2018 The system was off on arrival. The air stripper high high water level light was on. Removed and cleaned the effluent piping. Reinstalled the effluent piping and restarted the system. The sump level remained difficult to set. Additional troubleshooting necessary.

Down time: 4 hours.

- 12/5/2018 Increased the effluent flow rate. Down time: None.
- 12/6/2018 Trouble controlling sump level. Removed the sump sight glass. The majority of the upper port was plugged with iron bacteria. Cleaned the upper port and reinstalled the site glass. Restarted the system and reset the influent and effluent flow rates. Normal operation was observed.

Down time: None.

- 12/7/2018 Increased the influent flow rate. Down time: None.
- 12/14/2018 Increased the influent flow rate. Down time: None.
- 12/19/2018 Increased the influent flow rate. Down time: None.
- 12/24/2018 Increased the influent flow rate. Down time: None.
- 12/25/2018 Christmas Day. The inspection was not performed. Meter readings were estimated. Down time: None.

# Inspection and Maintenance Activities Fiscal Year 2019 Site K, OU2 Arden Hills, Minnesota

## December

- 12/26/2018 Increased the influent flow rate. Down time: None.
- 12/28/2018 Decreased the influent flow rate and increased the effluent flow rate slightly. Down time: None.

## January 2019

- 1/7/2019Increased the influent flow rate.Down time: None.
- 1/9/2019Decreased the influent flow rate.Down time: None.
- 1/11/2019 Increased the influent flow rate. Down time: None.
- 1/14/2019 Increased the influent flow rate. Down time: None.
- 1/16/2019 Increased the influent flow rate. Down time: None.
- 1/19/2019 Increased the influent flow rate. Down time: None.
- 1/24/2019 Increased the influent flow rate. Down time: None.
- 1/25/2019 Increased the influent flow rate. Down time: None.
- 1/27/2019Increased the influent flow rate.Down time: None.

# Inspection and Maintenance Activities Fiscal Year 2019 Site K, OU2 Arden Hills, Minnesota

# February

2/5/2019	Increased the influent flow rate. Down time: None.
2/6/2019	Decreased the influent flow rate. Down time: None.
2/7/2019	Increased the influent flow rate. Down time: None.
2/8/2019	Decreased the influent flow rate. Down time: None.
2/19/2019	Exercised the effluent valve. Down time: None.
2/20/2019	Eight inches of snow fell last night. Down time: None.
2/26/2019	Turned the pump on in Hand and exercised and reset the influent and effluent flow rate valves.
	Down time: None.
March 2019	
3/8/2019	The system was off during the inspection due to normal cycling from a low groundwater elevation.
	Down time: None
3/9/2019	The system was off during the inspection due to normal cycling from a low groundwater elevation.
	Down time: None
3/10/2019	The system was off during the inspection due to normal cycling from a low groundwater elevation.
	Down time: None

# Inspection and Maintenance Activities Fiscal Year 2019 Site K, OU2 Arden Hills, Minnesota

## March 2019

3/11/2019	The system was off during the inspection due to normal cycling from a low groundwater elevation.
	Down time: None
3/12/2019	The system was off during the inspection due to normal cycling from a low groundwater elevation.
	Down time: None
3/13/2019	The system was off during the inspection due to normal cycling from a low groundwater elevation. Checked the pump on and off floats in the manhole. Observed normal operation.
	Down time: None
3/16/2019	The system was off during the inspection due to normal cycling from a low groundwater elevation.
	Down time: None
3/19/2019	The maximum influent flow rate was 10 gpm when the typical maximum flow rate is approximately 18 gpm. There may be blockage at the nozzle at the top of the tower. Additional troubleshooting is necessary.
	Down time: None
3/20/2019	Disassembled the top of the tower and inspected the influent flow nozzle. No blockage was found. Reassembled the top of the tower. Cleaned the influent flow control valve and restarted the pump. The influent flow rate increased to 10.7 gpm.
	Down time: None
3/22/2019	The system was off during the inspection due to normal cycling from a low groundwater elevation. Heavy snow melt and coincidental ponding around the treatment building. Removed debris from the storm sewer inlet to improve the standing water drainage to the storm sewer. Observed substantial flow into the storm sewer.
	Down time: None

# Inspection and Maintenance Activities Fiscal Year 2019 Site K, OU2 Arden Hills, Minnesota

## March 2019

3/23/2019 The system was off during the inspection due to normal cycling from a low groundwater elevation.

Down time: None

3/24-29/2019 The maximum influent flow rate was 9.2 gpm. Removed the pump from the manhole and inspected the lift system. There was blockage (pieces of plastic and gravel) at the inlet to the pump. Removed the blockage and reinstalled the pump. The flow rate increased to normal (approximately 18 gpm). Set the flow rate to 11 gpm and observed normal operation.

Down time: 12.3 hours

## April 2019

- 4/3/2019 Increased the influent flow rate slightly. Down time: None
- 4/10/2019 Increased the influent flow rate slightly. Down time: None
- 4/11/2019 Increased the influent flow rate slightly. Down time: None
- 4/16/2019 Increased the influent flow rate slightly. Down time: None
- 4/18-23/2019 The system was off upon arrival and there was no power to the treatment system. Contacted Xcel Energy and they found a branch from an Osprey nest on the power lines. The branch blew two fuses on the power line. The fuses were located above a marsh. Xcel obtained the necessary equipment and relocated the fuses to a more suitable area. They restored power and the system was restarted. Normal operation was observed.

Down time: 119.2 hours.

4/29/2019 Turned the system off and replaced the influent hose and fittings. Restarted the system and reset the influent and effluent flow rates.

Down time: None.

# Inspection and Maintenance Activities Fiscal Year 2019 Site K, OU2 Arden Hills, Minnesota

## April 2019

4/30/2019 The influent flow rate decreased overnight for an unknown reason. Turned the system off and repaired a leak in the influent piping. Restarted the system and observed normal operation.

Down time: 14.9 hours.

## May 2019

- 5/21/2019 Increased the influent flow rate slightly. Down time: None.
- 5/23/2019 Increased the influent flow rate slightly. Down time: None.
- 5/24/2019 Increased the influent flow rate slightly. Down time: None.
- 5/26-28/2019 The pumping flow rate decreased significantly and it was not possible to increase it by opening the influent flow control valve. Removed the sump pump from the manhole and observed the impeller was damaged. Installed a new sump pump from inventory and restarted the system. Normal operation was observed.

Down time: 61.6 hours.

5/29/2019 The flow rate dropped overnight. Possible break-in period for the new sump pump installed yesterday.

Down time: 9.2 hours.

#### June 2019

- 6/6/2019 Decreased the influent flow rate slightly. Down time: None
- 6/10/2019 Increased the influent flow rate slightly. Down time: None
- 6/14/2019 The flow rate slowed overnight. Increased the influent flow rate slightly. Down time: 4 hours.

# Inspection and Maintenance Activities Fiscal Year 2019 Site K, OU2 Arden Hills, Minnesota

# June 2019

6/16/2019	The flow rate slowed overnight. Increased the influent flow rate. Down time: 6 hours.
6/17/2019	The flow rate slowed overnight. Increased the influent flow rate slightly. Down time: 1.5 hours.
6/19/2019	The flow rate slowed overnight. Increased the influent flow rate slightly. Down time: 9 hours.
6/20/2019	Turned the system off and replaced the blower motor. Restarted the system and observed normal operation.
	Down time. 5 hours.
6/25/2019	Increased the influent flow rate. Increased the airflow pressure into the system from 22 inches of water to 25 inches of water.
	Down time: 1.5 hours.
6/29/2019	The system was off on arrival and the "Flow Meter Low Flow Rate" light was on. Reset the system and exercised and reset the influent and effluent flow control valves. Observed normal operation.
	Down time: 10 hours.
<b>July 2019</b> 7/2/2019	Turned the system off and cleaned the sump site glass. Down time: None.
7/2/2019	Increased the influent flow rate slightly. Down time: None.
7/5/2019	Increased the influent flow rate slightly. Down time: None.
7/8/2019	Increased the influent flow rate slightly. Down time: None.
# Appendix <.1

# Inspection and Maintenance Activities Fiscal Year 2019 Site K, OU2 Arden Hills, Minnesota

# July 2019

7/9/2019	The flow rate slowed overnight. Increased the influent flow rate slightly. Down time: 4.5 hours.
7/10/2019	The flow rate slowed overnight. Increased the influent flow rate slightly. Down time: 2 hours.
7/15/2019	Increased the influent flow rate slightly. Down time: None.
7/18/2019	Turned the system off and cleaned the sump sight glass. Flushed the tower, exercised the influent and effluent flow control valves and reset the system. Down time: None.
7/22/2019	The flow rate slowed overnight. Increased the influent flow rate slightly. Down time: 14 hours.
7/23/2019	The flow rate slowed overnight. Increased the influent flow rate slightly. Down time: 3 hours.
7/26/2019	The "Low Flow Rate" alarm was on upon arrival. Reset the system and the influent and effluent flow rates. Observed normal operation. Down time: 22 hours.
August 2019	
8/1/2019	Increased the influent flow rate slightly. Down time: None.
8/2/2019	Increased the influent flow rate slightly. Down time: None.
8/3/2019	The system was down on arrival due to a power outage. Xcel Energy was contacted and they repaired the problem. Restarted the system and observed normal operation. Down time: 3 hours.

# Inspection and Maintenance Activities<sup>•</sup> Fiscal Year 2019<sup>•</sup> Site K, OU2<sup>•</sup> Arden Hills, Minnesota<sup>•</sup>

# August 2019

8/4/2019	Increased the influent flow rate slightly. Down time: None.
8/8/2019	Increased the influent flow rate slightly. Down time: None.
8/9/2019	The flow rate slowed overnight. Increased the influent flow rate slightly. Down time: 4.5 hours.
8/10/2019	The flow rate slowed overnight. Increased the influent flow rate slightly. Down time: 3 hours.
8/14/2019	The flow rate slowed overnight. Increased the influent flow rate slightly. Down time: None.
8/18/2019	The flow rate slowed overnight. Increased the influent flow rate slightly. Down time: None.
8/20/2019	The flow rate slowed overnight. Increased the influent flow rate slightly. Down time: None.
8/27/2019	The flow rate slowed overnight. Increased the influent flow rate slightly. Down time: 4 hours.
8/28/2019	The flow rate slowed overnight. Increased the influent flow rate slightly. Down time: 3 hours.
September	
9/2/2019	Labor Day. No inspection was performed. Meter readings were estimated. Down time: None.
9/3/2019	Increased the influent flow rate slightly. Down time: None.

# Inspection and Maintenance Activities Fiscal Year 2019 Site K, OU2 Arden Hills, Minnesota

# September

9/8/2019	Increased the influent flow rate slightly. Down time: None.
9/12/2019	Flushed the influent and effluent lines and exercised and reset the influent and effluent flow valves. Cleaned the sump sight glass.
	Down time: None.
9/19/2019	Increased the influent flow rate slightly. Down time: None.
9/23/2019	The system was off and the high water level alarm light was lit. Opened the effluent flow control valve and drained the effluent water. Restarted the system and reset the influent and effluent flow rates. Observed normal operation.
	Down time: 25.7 hours.
9/24/2019	Increased the influent flow rate slightly. Down time: None.
9/25/2019	Increased the influent flow rate slightly. Down time: None.
9/29/2019	Increased the influent flow rate slightly. Down time: None.

## Fiscal Year 2019 TGRS, OU2

October 2018	
10/3/2018	Pumphouses B9. The light was flashing on the well field panel. At the pumphouse, the pump was off. Reset the controls and turned the control switch to auto. The pump started normally.
	Down time: 5.5 hours.
10/4/2018	Pumphouse B9. The light was flashing on the well field panel. Reset the PLC and the light came on normally. At the pumphouse the pump was operating normally.
	Down time: 15 hours.
10/17/2018	Treatment System. Cleaned the blower intake screens for towers 3 and 4. Down time: None.
10/31/2018	Treatment System. Removed, cleaned and replaced the demister pads in towers 3 and 4. To minimize well field cycling, turned the pumps in B6 and B9 to off. After completion of the work, turned the pumps on at B6 and B9 and observed normal operation
	Down time: 2 hours of down time occurred at B9 on 10/31/2018, but the down time will be reported on 11/1/2018 because the daily inspection had already been performed prior to the work on 10/31/2018.
November 2018	
11/1/2018	Treatment System. Removed, cleaned and replaced the demister pads in towers 3 and 4. Turned pumps B6 and B9 off to minimize well field cycling. Following the work, turned the pumps back on and observed normal operation.
	Down time: 2 hours at B9.
11/3/2018	Pumphouse B1: The pump would not run in Auto. Replaced the I/O adapter card with one from inventory. Restarted the pump and observed normal operation.
	Down time: None.
11/7/2018	Pumphouses SC1 and B11: The existing pumphouse heaters would not produce heat. Placed temporary electric heaters in the pumphouses and scheduled Preferred Electric.
	Down time: None.
11/8-12/2018	Pumphouse B1: The RPZ was leaking. Following troubleshooting efforts, turned the pump to off. Scheduled Jayhawk Mechanical and they repaired the RPZ.
	Down time: 73.5 hours.

## Fiscal Year 2019 TGRS, OU2

#### Arden Hills, Minnesota

# November 2018 11/9/2018 Pumphouse B1: The pump would not run in Auto. Swapped I/O adapter cards with B13 but the pump still did not run in Auto. Turned the controls to Hand and the pump started. Additional troubleshooting necessary. Down time: None. 11/12/2018 Pumphouse B3: Decreased the flow rate. Down time: None. 11/15/2018 Pumphouse B11: Preferred Electric installed a new thermostat for the heater. The heater turned on normally. Down time: None. 11/15/2018 Pumphouse SC1: Preferred Electric repaired the electric heater. Down time: None. 11/21-30/2018 Treatment System: The pump shaft for Pump 4 was wobbling and spraying water out the gland packing. Thein Well on site to assess the condition of the pump. They pulled the pump and brought it in to be rebuilt. Turned pumps B3 and B9 off to minimize well field cycling with only Pump 3 in the treatment center operating. They reinstalled the pump and turned the pump on. The pump operated normally. Following the work, turned the pumps on in B3 and B9 and observed normal operation. SC1 cycled on and off during the work. Down time: 92.5 hours at B3, 96 hours at B9, and 36.5 hours at SC1. 11/22/2018 Thanksgiving Day holiday. The daily inspection was not performed. Meter readings were estimated. Down time: None. December 2018 12/18/2018 Pumphouse SC5. The flow meter was not operating properly. Changed out the flow meter with a new one from inventory and opened the ECV all the way to maximize the flow rate. Down time: None.

# Fiscal Year 2019 TGRS, OU2

January 2019	
1/9/2019	Treatment System. Turned Pump 4 off to change the motor oil and grease the lower bearings. Turned the pumps in B5 and B8 off during the work to minimize well field cycling with only Pump 3 in the treatment center operating. Following the work, restarted Pump 4 and observed normal operation. Turned the pumps in B5 and B8 back to on and observed normal operation.
	Down time: None.
1/11/2019	Pumphouses B6 and B13. Increased the flow rates slightly. Down time: None.
1/16/2019	Pumphouses B6 and B13. Increased the flow rates slightly again. Down time: None.
1/18-25/19	Pumphouse B8. The RPZ backflow preventer was leaking. Turned the pump off and contacted Jayhawk Mechanical. Upon inspection, the cast iron 90 degree elbows were pitted and had pin holes, new parts were ordered and installed. Turned the pump on and normal operation was observed.
	Down time: 167 hours.
1/18-25/2019	Pumphouse B3. Increased the flow rate to maximum to help with the loss of flow at B8. Down time: None.
1/24/2019	Treatment System. The valve stem and drain lines for ECV 4 were leaking. Removed and replaced the valve stem packing and tightened the valve stem bushing. Also, replaced the ECV control piping drain lines. Following the work, the valve stem and drain lines no longer leaked.
	Down time: None.
1/30/2019	Pumphouse B8. The RPZ was again leaking most likely due to sand grains lodged in the seals. Turned the pump off and contacted Jayhawk Mechanical. With B8 off, increased the flow rate at B3 to maximum.
	Down time: 26 hours.

## Fiscal Year 2019 TGRS, OU2

February 2019 2/1-7/2019	Pumphouse B8. The RPZ was leaking likely due to sand grains lodged in the seals,
	Mechanical. With B8 off, increased the flow rate at B3 to maximum to maintain system flow rates. Jayhawk repaired the RPZ and turned the pump on for normal service.
	Down time: 162.5 hours.
2/3/2019	Pumphouse B4. One of the phases of the drop line from the power pole to the pumphouse was shorting out to the support cable. Contacted Xcel and they responded. Shutdown pumphouses B5, B6, and B9 and Xcel opened the fusible links on the power pole behind B5. Xcel replaced/spliced 2 of the wires and repaired the neutral cable to the building. Turned B4 back on and observed normal operation. Turned pumphouses B5, B6 and B9 back on and observed normal operation.
	Down time: None (the extraction wells met their required daily flow rates for the day).
2/12/2019	Pumphouse B3. Opened the ECV to maximum to maximize the flow rate. Down time: None.
2/14-18/2019	Pumphouse B9. The pump was off upon arrival. Troubleshooting indicated a communication issue. Turned the pump on in "Hand" to minimize down time. Replaced the communication cards in the control panel with new from inventory and restarted the pump. The pump restarted normally and observed normal operation.
	Down time: 22.5 hours.
2/26/2019	Treatment System. ECV 3 would not close on command. Removed and replaced portions of the control piping. Turned Pump 3 on and exercised the valve several times. The valve closed normally.
	Down time: None.
2/26-28/2019	Pumphouse SC1. The flow meter stopped totaling. Removed the flow meter and cleaned the body and impellars. Reinstalled the meter and turned the pump on. Normal operation observed.
	Down time: 2 hours. Meter readings were estimated.
March 2019	
3/6/2019	Treatment System. ECV 4 was closing slowly. Exercised the control valves on the control piping and removed and cleaned the check valves on the control piping.
	Down time: None.

## Fiscal Year 2019 TGRS, OU2

March 2019	
3/8/2019	Treatment System. ECV 3 would not close all the way. Removed and cleaned the check valves and exercised the control valves and the valve body.
	Down time: None.
3/10-11/2019	There was a snow storm. DK Concrete removed snow from Site roads.
	Down time: None.
3/14/2019	Pumphouse SC1. Localized flooding caused approximately 2" of standing water on the pumphouse floor.
	Down time: None.
3/15/2019	Pumphouse B1. There was some standing water in the pumphouse from localized flooding.
	Down time: None.
3/18/2019	Treatment System. The coil on the emergency solenoid at ECV 4 was buzzing. Removed and replaced the solenoid valve body and coil.
	Down time: None.
3/29/2019	Pumphouse B6. The RPZ was leaking. Contacted Jayhawk Mechanical and they repaired the RPZ.
	Down time: 20.2 hours.
April 2019	
4/13/2019	Pumphouse B3. Slowed the flow rate slightly. Down time: None.
4/15-17/2019	Pumphouse B6. The RPZ was leaking. Turned the pump off and contacted Jayhawk Mechanical and they repaired the problem.
	Down time: 46.2 hours.
4/15/2019	Pumphouses B3 and B8. Increased the flow rates to maximum. Down time: None.
4/17/2019	Pumphouses B3 and B8. Decreased their flow rates slightly. Down time: None.

## Fiscal Year 2019 TGRS, OU2

April 2019	
4/18/2019	Pumphouse B1. The RPZ was leaking. Cycled the pump, drained/flushed the RPZ and restarted the pump. Observed normal operation.
	Down time: None.
4/26/2019	Pumphouse B6. Increased the flow rate slightly. Down time: None.
May 2019	
5/20-21/2019	Pumphouse SC1. The flow meter stopped totaling. Removed the flow meter, cleaned the meter with acid and reinstalled the meter. Restarted the pump and observed normal operation. Meter readings were estimated.
	Down time: None.
5/20-21/2019	Pumphouse B5. The RPZ backflow preventer was leaking. Attempted to stop the leak but to no avail. Contacted Jayhawk Mechanical and they repaired the leak.
	Down time: None.
5/21/2019	Pumphouse SC5. The ECV would not actuate properly. Locked the valve open and removed the control piping. Additional work rebuilding the control piping will be necessary.
	Down time: 2 hours.
5/28/2019	Pumphouse SC5. The RPZ was leaking. Turned the pump off and exercised the valves. Restarted the pump and observed normal operation.
	Down time: 1.5 hours.
June 2019	
6/4-5/2019	Pumphouse SC5. The flow meter stopped totaling. Replaced the flow meter with one from inventory.
	Down time: None. Meter readings were estimated.
6/11/2019	Pumphouse B4. Power outage. Contacted Xcel Energy and they repaired bad power line connectors on the power pole adjacent to B5.
	Down time: 6.5 hours.

## Fiscal Year 2019 TGRS, OU2

June 2019	
6/13/2019	Pumphouses B1, B13, B3, B4, B5, B6, B8 and B9. Power outage. Contacted Xcel Energy. They replaced a fuse on a power pole near B8. Restarted the wells and observed normal operation.
	Down time: 2.5 hours at B1, B13 and B9 and 3 hours at B4.
6/14/2019	Pumphouse B1. The RPZ backflow preventer was leaking. Turned the pump off. Cycled the pump, flushed the backflow preventer and valves and restarted the pump. Observed normal operation.
	Down time: 2 hours.
6/15-24/2019	Pumphouse SC1. The flow meter stopped totaling. Removed the flow meter and cleaned it with muriatic acid. Reinstalled the flow meter and observed normal operation.
	Down time: None. Meter readings were estimated.
6/20/2019	Pumphouse B1. The RPZ backflow preventer was leaking. Turned the pump off and flushed the backflow preventer and associated valves. Restarted the pump and observed normal operation.
	Down time: None.
6/20-21/2019	Pumphouse B8. There was water spraying from the riser pipe into the well. Turned the pump off and contacted Thein Well. They removed the lift system and replaced sections of riser pipe. Restarted the pump and observed normal operation.
	Down time: 22 hours.
6/21/2019	Pumphouse B4. Turned off the pump and replaced the pump and motor with new from inventory. Following the work, turned the new pump on and observed normal operation.
	Down time: 5 hours.
6/24-26/2019	Pumphouse B9. There was a hole in the upstream elbow of the RPZ backflow preventer. Turned the pump off and contacted Jayhawk Mechanical. They replaced the elbow with a new one from inventory.
	Down time: 54 hours.

## Fiscal Year 2019 TGRS, OU2

June 2019	
6/28/2019	Pumphouses B3 and B4. Lowered the flow rate at B3 and increased the flow rate at B4 to maximum.
	Down time: None.
July 2019	
7/2/2019	Pumphouse B1. The RPZ backflow preventer was leaking. Forced the ECV to close which turned the pump off, opened the top valve on the RPZ and opened the upstream valve to release the pressure. Closed the valves and restarted the pump and slowly opened the ECV. The RPZ did not leak. Observed normal operation.
	Down time: None.
7/3/2019	Treatment System. Changed the oil in Pump 4. Turned off wells B6 and B9 to minimize well field cycling with only Pump 3 operating. Following the work, restarted Pump 4 and observed normal operation. Turned B6 and B9 back on for normal operation.
	Down time. 2 hours each at bo and by
7/3/2019	Treatment System. Pump 3 would not start in Auto. Turned the well field off and inspected the Pump 3 start and stop floats in Wet Well 3. The Pump 3 stop float was broken. Replaced the float and restarted the treatment system and well field in auto. Pump 3 started in Auto normally. Down time: 1 hour at B6, 1.5 hours at B13 and B9 and 2 hours at B1.
7/4/2019	Independence Day. The daily inspection was not performed. Meter readings were estimated.
	Down time: None.
7/29/2019	Pumphouse B1. The RPZ backflow preventer was leaking. Turned the pump off to stop water from leaking on the floor. The following day, forced the ECV to close which turned the pump off, opened the top valve on the RPZ and opened the upstream valve to release the pressure. Closed the valves and restarted the pump and slowly opened the ECV. The RPZ did not leak. Observed normal operation.
	Down time: 30 hours.
August 2010	
8/1/2019	Treatment System. ECV 4 would not close. Removed and replaced portions of ECV 4's control piping. Cycled the valve and observed normal operation. Turned off wells B6 and B9 to minimize well field cycling with only Pump 3 operating.
	Down time: 5 hours at B6 and B9.

## Fiscal Year 2019 TGRS, OU2

August 2019	
8/3/2019	Treatment System and Well Field. Site wide power outage. Contacted Xcel Energy and turned off the extraction wells. Xcel repaired the problem. Turned the wells back on and reset the PLC in Building 116. The TGRS restarted normally.
	Down time: 4 hours at B1; 3.5 hours at B6 and B9; 3 hours at B13 and SC5; 2 hours at B3, B8 and SC1.
8/4/2019	Pumphouse SC5. The ECV closed slightly overnight. Replaced the strainer screen and flushed the control piping. Cycled the ECV and observed normal operation.
	Down time: 1.5 hours.
8/6/2019	Pumphouse SC5. The light was flashing on the well field panel. Reset the PLC and the light came on normally. At the pumphouse, the pump was operating normally. Down time: 24 hours.
8/7/2019	Pumphouse B9. The light was off on the well field panel. At the pumphouse the pump was off and the pump would pump in Hand but not in Auto. Troubleshooting indicated a blown I/O adapter module. Replaced the module and the pump restarted normally.
	Down time: 16 hours.
8/9-13/2019	Pumphouse SC1. The flow meter was not totaling. Removed, cleaned and replaced the flow meter. The meter began totaling normally.
	Down time: None. Meter readings were estimated.
8/12-17/2019	Pumphouse SC5. Turned the pump off to redevelop the well. Also, replaced the pump and motor. Following the work, turned the pump on and observed normal operation.
	Down time: 93.5 hours.
8/15-21/2019	Pumphouse B1. The light on the well field panel was off. At the pumphouse, the pump would not pump in Auto or Hand. Troubleshooting indicated a blown motor. Thein Well replaced the pump and motor. Restarted the pump and observed normal operation.
	Down time: 141.5 hours.
8/26/2019	Treatment System. ECV 2 would not open. Replaced portions of the control piping. Cycled the valve and observed normal operation. Turned off B1, B9 and SC1 during the work to minimize well field cycling.
	Down time: 1 hour at B1 and SC1; 2 hours at B9.

## Fiscal Year 2019 TGRS, OU2

#### Arden Hills, Minnesota

# September 2019 9/1/2019 Pumphouse SC5. Turned the pump off and replaced portions of the control piping on the ECV. Following the work, turned the pump on and set the flow rate to 80 gpm. Down time: 3.5 hours. 9/11/2019 Pumphouse SC5. The light was flashing on the well field panel. Reset the PLC and the light came back on steady. At the pumphouse, the pump was operating normally. Down time: 5.5 hours. 9/11-12/2019 Pumphouses B1, B13, B6, B9 and SC1. Turned the pumps off to remove and clean the demister pads. Also, turned the TGRS off while MidAmerica inspected the condition of the packing and water distribution systems in Towers 3 and 4. Following the work, turned the TGRS back on and observed normal operation. Down time: 2 hours at B1, B13 and SC1. 2.5 hours at B6 and B9. 9/14/2019 Pumphouses B1, B13, B6 and B9. The pumps were not pumping and there was minimal power to the pumphouses. Contacted Xcel Energy. They replaced two fuses and an arrester on the power poles near old Gate 4. Following the repair, turned the TGRS on and observed normal operation. Down time: 1.5 hours at B1 and B13. Two hours at B6 and B9. 9/28-29/2019 Pumphouses B1, B13, B5, B6, B8, B9, SC1 and SC5. The pumps were off. Troubleshooting indicated that the high float in Wet Well 2 was activated. Pumped the water from the VAP study out of the wet well and the pumps came back on normally. Down time: 13 hours at B1. 19.5 hours at B5. 24 hours at B8. 25 hours at B13. 24.5 hours at SC5. 25.5 hours at B6. 26 hours at B9 and SC1. 9/30/2019 Pumphouse B13. The ECV closed slightly decreasing the flow rate overnight. Cleaned the strainer screen and flushed the control piping. Restarted the pump and observed normal operation.

Down time: 14 hours.

# Maintenance Activities By Location Fiscal Year 2018 TGRS, OU2 Arden Hills, Minnesota

## Pumphouse B1

11/3/2018	Pumphouse B1: The pump would not run in Auto. Replaced the I/O adapter card with one from inventory. Restarted the pump and observed normal operation.
	Down time: None.
11/8-12/2018	Pumphouse B1: The RPZ was leaking. Following troubleshooting efforts, turned the pump to off. Scheduled Jayhawk Mechanical and they repaired the RPZ.
	Down time: 73.5 hours.
11/9/2018	Pumphouse B1: The pump would not run in Auto. Swapped I/O adapter cards with B13 but the pump still did not run in Auto. Turned the controls to Hand and the pump started. Additional troubleshooting necessary.
	Down time: None.
3/15/2019	Pumphouse B1. There was some standing water in the pumphouse from localized flooding.
	Down time: None.
4/18/2019	Pumphouse B1. The RPZ was leaking. Cycled the pump, drained/flushed the RPZ and restarted the pump. Observed normal operation.
	Down time: None.
6/13/2019	Pumphouses B1, B13, B3, B4, B5, B6, B8 and B9. Power outage. Contacted Xcel Energy. They replaced a fuse on a power pole near B8. Restarted the wells and observed normal operation.
	Down time: 2.5 hours at B1, B13 and B9 and 3 hours at B4.
6/14/2019	Pumphouse B1. The RPZ backflow preventer was leaking. Turned the pump off. Cycled the pump, flushed the backflow preventer and valves and restarted the pump. Observed normal operation.
	Down time: 2 hours.
6/20/2019	Pumphouse B1. The RPZ backflow preventer was leaking. Turned the pump off and flushed the backflow preventer and associated valves. Restarted the pump and observed normal operation.
	Down time: None.

# Maintenance Activities By Location Fiscal Year 2018 TGRS, OU2 Arden Hills, Minnesota

7/2/2019 Pumphouse B1. The RPZ backflow preventer was leaking. Forced the ECV to close which turned the pump off, opened the top valve on the RPZ and opened the upstream valve to release the pressure. Closed the valves and restarted the pump and slowly opened the ECV. The RPZ did not leak. Observed normal operation.

Down time: None.

7/3/2019 Treatment System. Pump 3 would not start in Auto. Turned the well field off and inspected the Pump 3 start and stop floats in Wet Well 3. The Pump 3 stop float was broken. Replaced the float and restarted the treatment system and well field in auto. Pump 3 started in Auto normally.

Down time: 1 hour at B6, 1.5 hours at B13 and B9 and 2 hours at B1.

7/29/2019 Pumphouse B1. The RPZ backflow preventer was leaking. Turned the pump off to stop water from leaking on the floor. The following day, forced the ECV to close which turned the pump off, opened the top valve on the RPZ and opened the upstream valve to release the pressure. Closed the valves and restarted the pump and slowly opened the ECV. The RPZ did not leak. Observed normal operation.

Down time: 30 hours.

8/3/2019 Treatment System and Well Field. Site wide power outage. Contacted Xcel Energy and turned off the extraction wells. Xcel repaired the problem. Turned the wells back on and reset the PLC in Building 116. The TGRS restarted normally.

Down time: 4 hours at B1; 3.5 hours at B6 and B9; 3 hours at B13 and SC5; 2 hours at B3, B8 and SC1.

- 8/15-21/2019 Pumphouse B1. The light on the well field panel was off. At the pumphouse, the pump would not pump in Auto or Hand. Troubleshooting indicated a blown motor. Thein Well replaced the pump and motor. Restarted the pump and observed normal operation Down time: 141.5 hours.
- 8/26/2019 Treatment System. ECV 2 would not open. Replaced portions of the control piping. Cycled the valve and observed normal operation. Turned off B1, B9 and SC1 during the work to minimize well field cycling.

Down time: 1 hour at B1 and SC1; 2 hours at B9.

9/11-12/2019 Pumphouses B1, B13, B6, B9 and SC1. Turned the pumps off to remove and clean the demister pads. Also, turned the TGRS off while MidAmerica inspected the condition of the packing and water distribution systems in Towers 3 and 4. Following the work, turned the TGRS back on and observed normal operation.

Down time: 2 hours at B1, B13 and SC1. 2.5 hours at B6 and B9.

# Maintenance Activities By Location Fiscal Year 2018 TGRS, OU2 Arden Hills, Minnesota

9/14/2019 Pumphouses B1, B13, B6 and B9. The pumps were not pumping and there was minimal power to the pumphouses. Contacted Xcel Energy. They replaced two fuses and an arrester on the power poles near old Gate 4. Following the repair, turned the TGRS on and observed normal operation.

Down time: 1.5 hours at B1 and B13. Two hours at B6 and B9.

9/28-29/2019 Pumphouses B1, B13, B5, B6, B8, B9, SC1 and SC5. The pumps were off. Troubleshooting indicated that the high float in Wet Well 2 was activated. Pumped the water from the VAP study out of the wet well and the pumps came back on normally.

Down time: 13 hours at B1. 19.5 hours at B5. 24 hours at B8. 25 hours at B13. 24.5 hours at SC5. 25.5 hours at B6. 26 hours at B9 and SC1.

#### **Pumphouse B3**

- 11/12/2018 Pumphouse B3: Decreased the flow rate. Down time: None.
- 11/21-30/2018 Treatment System: The pump shaft for Pump 4 was wobbling and spraying water out the gland packing. Thein Well on site to assess the condition of the pump. They pulled the pump and brought it in to be rebuilt. Turned pumps B3 and B9 off to minimize well field cycling with only Pump 3 in the treatment center operating. They reinstalled the pump and turned the pump on. The pump operated normally. Following the work, turned the pumps on in B3 and B9 and observed normal operation. SC1 cycled on and off during the work.

Down time: 92.5 hours at B3, 96 hours at B9, and 36.5 hours at SC1.

1/18-25/2019 Pumphouse B3. Increased the flow rate to maximum to help with the loss of flow at Down time: None.

## Appendix <.3

# Maintenance Activities By Location Fiscal Year 2018 TGRS, OU2 Arden Hills, Minnesota

1/30/2019	Pumphouse B8. The RPZ was again leaking most likely due to sand grains lodged in the seals. Turned the pump off and contacted Jayhawk Mechanical. With B8 off, increased the flow rate at B3 to maximum.
	Down time: 26 hours.
2/1-7/2019	Pumphouse B8. The RPZ was leaking likely due to sand grains lodged in the seals, which has occurred in the past. Turned the pump off and contacted Jayhawk Mechanical. With B8 off, increased the flow rate at B3 to maximum to maintain system flow rates. Jayhawk repaired the RPZ and turned the pump on for normal service. Down time: 162.5 hours.
2/12/2019	Pumphouse B3. Opened the ECV to maximum to maximize the flow rate. Down time: None.
4/13/2019	Pumphouse B3. Slowed the flow rate slightly. Down time: None.
4/15/2019	Pumphouses B3 and B8. Increased the flow rates to maximum. Down time: None.
4/17/2019	Pumphouses B3 and B8. Decreased their flow rates slightly. Down time: None.
6/13/2019	Pumphouses B1, B13, B3, B4, B5, B6, B8 and B9. Power outage. Contacted Xcel Energy. They replaced a fuse on a power pole near B8. Restarted the wells and observed normal operation.
	Down time: 2.5 hours at B1, B13 and B9 and 3 hours at B4.
6/28/2019	Pumphouses B3 and B4. Lowered the flow rate at B3 and increased the flow rate at B4 to maximum.
	Down time: None.
8/3/2019	Treatment System and Well Field. Site wide power outage. Contacted Xcel Energy and turned off the extraction wells. Xcel repaired the problem. Turned the wells back on and reset the PLC in Building 116. The TGRS restarted normally.
	Down time: 4 hours at B1; 3.5 hours at B6 and B9; 3 hours at B13 and SC5; 2 hours at B3, B8 and SC1.

# Maintenance Activities By Location Fiscal Year 2018 TGRS, OU2 Arden Hills, Minnesota

2/3/2019	Pumphouse B4. One of the phases of the drop line from the power pole to the pumphouse was shorting out to the support cable. Contacted Xcel and they responded. Shutdown pumphouses B5, B6, and B9 and Xcel opened the fusible links on the power pole behind B5. Xcel replaced/spliced 2 of the wires and repaired the neutral cable to the building. Turned B4 back on and observed normal operation. Turned pumphouses B5, B6 and B9 back on and observed normal operation.
	Down time: None (the extraction wells met their required daily flow rates for the day).
6/11/2019	Pumphouse B4. Power outage. Contacted Xcel Energy and they repaired bad power line connectors on the power pole adjacent to B5.
	Down time: 6.5 hours.
6/13/2019	Pumphouses B1, B13, B3, B4, B5, B6, B8 and B9. Power outage. Contacted Xcel Energy. They replaced a fuse on a power pole near B8. Restarted the wells and observed normal operation.
	Down time: 2.5 hours at B1, B13 and B9 and 3 hours at B4.
6/21/2019	Pumphouse B4. Turned off the pump and replaced the pump and motor with new from inventory. Following the work, turned the new pump on and observed normal operation.
	Down time: 5 hours.
6/28/2019	Pumphouses B3 and B4. Lowered the flow rate at B3 and increased the flow rate at B4 to maximum.
	Down time: None.
Pumphouse B5	
1/9/2019	Treatment System. Turned Pump 4 off to change the motor oil and grease the lower bearings. Turned the pumps in B5 and B8 off during the work to minimize well field cycling with only Pump 3 in the treatment center operating. Following the work, restarted Pump 4 and observed normal operation. Turned the pumps in B5 and B8

Down time: None.

back to on and observed normal operation.

# Maintenance Activities By Location Fiscal Year 2018 TGRS, OU2 Arden Hills, Minnesota

2/3/2019	Pumphouse B4. One of the phases of the drop line from the power pole to the pumphouse was shorting out to the support cable. Contacted Xcel and they responded. Shutdown pumphouses B5, B6, and B9 and Xcel opened the fusible links on the power pole behind B5. Xcel replaced/spliced 2 of the wires and repaired the neutral cable to the building. Turned B4 back on and observed normal operation. Turned pumphouses B5, B6 and B9 back on and observed normal operation.
	Down time. None (the extraction wens met their required daily now rates for the day).
5/20-21/2019	Pumphouse B5. The RPZ backflow preventer was leaking. Attempted to stop the leak but to no avail. Contacted Jayhawk Mechanical and they repaired the leak.
	Down time. None.
6/13/2019	Pumphouses B1, B13, B3, B4, B5, B6, B8 and B9. Power outage. Contacted Xcel Energy. They replaced a fuse on a power pole near B8. Restarted the wells and observed normal operation.
	Down time: 2.5 hours at B1, B13 and B9 and 3 hours at B4.
9/28-29/2019	Pumphouses B1, B13, B5, B6, B8, B9, SC1 and SC5. The pumps were off. Troubleshooting indicated that the high float in Wet Well 2 was activated. Pumped the water from the VAP study out of the wet well and the pumps came back on normally.
	Down time: 13 hours at B1. 19.5 hours at B5. 24 hours at B8. 25 hours at B13. 24.5 hours at SC5. 25.5 hours at B6. 26 hours at B9 and SC1.
	Pumphouse B6
10/31/2018	Treatment System. Removed, cleaned and replaced the demister pads in towers 3 and 4. To minimize well field cycling, turned the pumps in B6 and B9 to off. After completion of the work, turned the pumps on at B6 and B9 and observed normal Down time: 2 hours of down time occurred at B9 on 10/31/2018, but the down time will be reported on 11/1/2018 because the daily inspection had already been
	performed prior to the work on 10/31/2018.
11/1/2018	Treatment System. Removed, cleaned and replaced the demister pads in towers 3 and 4. Turned pumps B6 and B9 off to minimize well field cycling. Following the work, turned the pumps back on and observed normal operation.

Down time: 2 hours at B9.

# Maintenance Activities By Location Fiscal Year 2018 TGRS, OU2 Arden Hills, Minnesota

1/11/2019	Pumphouses B6 and B13. Increased the flow rates slightly. Down time: None.
1/16/2019	Pumphouses B6 and B13. Increased the flow rates slightly again. Down time: None.
2/3/2019	Pumphouse B4. One of the phases of the drop line from the power pole to the pumphouse was shorting out to the support cable. Contacted Xcel and they responded. Shutdown pumphouses B5, B6, and B9 and Xcel opened the fusible links on the power pole behind B5. Xcel replaced/spliced 2 of the wires and repaired the neutral cable to the building. Turned B4 back on and observed normal operation. Turned pumphouses B5, B6 and B9 back on and observed normal operation.
	Down time: None (the extraction wells met their required daily flow rates for the day).
3/29/2019	Pumphouse B6. The RPZ was leaking. Contacted Jayhawk Mechanical and they repaired the RPZ.
	Down time: 20.2 hours.
4/15-17/2019	Pumphouse B6. The RPZ was leaking. Turned the pump off and contacted Jayhawk Mechanical and they repaired the problem.
	Down time: 46.2 hours.
4/26/2019	Pumphouse B6. Increased the flow rate slightly. Down time: None.
6/13/2019	Pumphouses B1, B13, B3, B4, B5, B6, B8 and B9. Power outage. Contacted Xcel Energy. They replaced a fuse on a power pole near B8. Restarted the wells and observed normal operation.
	Down time: 2.5 hours at B1, B13 and B9 and 3 hours at B4.
7/3/2019	Treatment System. Changed the oil in Pump 4. Turned off wells B6 and B9 to minimize well field cycling with only Pump 3 operating. Following the work, restarted Pump 4 and observed normal operation. Turned B6 and B9 back on for normal operation Down time: 2 hours each at B6 and B9

7/3/2019 Treatment System. Pump 3 would not start in Auto. Turned the well field off and inspected the Pump 3 start and stop floats in Wet Well 3. The Pump 3 stop float was broken. Replaced the float and restarted the treatment system and well field in auto. Pump 3 started in Auto normally.

# Maintenance Activities By Location Fiscal Year 2018 TGRS, OU2 Arden Hills, Minnesota

8/1/2019 Treatment System. ECV 4 would not close. Removed and replaced portions of ECV 4's control piping. Cycled the valve and observed normal operation. Turned off wells B6 and B9 to minimize well field cycling with only Pump 3 operating.

Down time: 5 hours at B6 and B9.

8/3/2019 Treatment System and Well Field. Site wide power outage. Contacted Xcel Energy and turned off the extraction wells. Xcel repaired the problem. Turned the wells back on and reset the PLC in Building 116. The TGRS restarted normally.

Down time: 4 hours at B1; 3.5 hours at B6 and B9; 3 hours at B13 and SC5; 2 hours at B3, B8 and SC1.

9/11-12/2019 Pumphouses B1, B13, B6, B9 and SC1. Turned the pumps off to remove and clean the demister pads. Also, turned the TGRS off while MidAmerica inspected the condition of the packing and water distribution systems in Towers 3 and 4. Following the work, turned the TGRS back on and observed normal operation.

Down time: 2 hours at B1, B13 and SC1. 2.5 hours at B6 and B9.

9/14/2019 Pumphouses B1, B13, B6 and B9. The pumps were not pumping and there was minimal power to the pumphouses. Contacted Xcel Energy. They replaced two fuses and an arrester on the power poles near old Gate 4. Following the repair, turned the TGRS on and observed normal operation.

Down time: 1.5 hours at B1 and B13. Two hours at B6 and B9.

9/28-29/2019 Pumphouses B1, B13, B5, B6, B8, B9, SC1 and SC5. The pumps were off. Troubleshooting indicated that the high float in Wet Well 2 was activated. Pumped the water from the VAP study out of the wet well and the pumps came back on normally.

Down time: 13 hours at B1. 19.5 hours at B5. 24 hours at B8. 25 hours at B13. 24.5 hours at SC5. 25.5 hours at B6. 26 hours at B9 and SC1.

# Maintenance Activities By Location Fiscal Year 2018 TGRS, OU2 Arden Hills, Minnesota

## Pumphouse B8

1/9/2019	Treatment System. Turned Pump 4 off to change the motor oil and grease the lower bearings. Turned the pumps in B5 and B8 off during the work to minimize well field cycling with only Pump 3 in the treatment center operating. Following the work, restarted Pump 4 and observed normal operation. Turned the pumps in B5 and B8 back to on and observed normal operation.
	Down time: None.
1/18-25/19	Pumphouse B8. The RPZ backflow preventer was leaking. Turned the pump off and contacted Jayhawk Mechanical. Upon inspection, the cast iron 90 degree elbows were pitted and had pin holes, new parts were ordered and installed. Turned the pump on and normal operation was observed.
	Down time: 167 hours.
1/18-25/2019	Pumphouse B3. Increased the flow rate to maximum to help with the loss of flow at Down time: None.
1/30/2019	Pumphouse B8. The RPZ was again leaking most likely due to sand grains lodged in the seals. Turned the pump off and contacted Jayhawk Mechanical. With B8 off, increased the flow rate at B3 to maximum.
	Down time: 26 hours.
2/1-7/2019	Pumphouse B8. The RPZ was leaking likely due to sand grains lodged in the seals, which has occurred in the past. Turned the pump off and contacted Jayhawk Mechanical. With B8 off, increased the flow rate at B3 to maximum to maintain system flow rates. Jayhawk repaired the RPZ and turned the pump on for normal service.
	Down time: 162.5 hours.
4/15/2019	Pumphouses B3 and B8. Increased the flow rates to maximum. Down time: None.
4/17/2019	Pumphouses B3 and B8. Decreased their flow rates slightly. Down time: None.
6/13/2019	Pumphouses B1, B13, B3, B4, B5, B6, B8 and B9. Power outage. Contacted Xcel Energy. They replaced a fuse on a power pole near B8. Restarted the wells and observed normal operation.
	Down time: 2.5 hours at B1, B13 and B9 and 3 hours at B4.

# Maintenance Activities By Location Fiscal Year 2018 TGRS, OU2 Arden Hills, Minnesota

6/20-21/2019 Pumphouse B8. There was water spraying from the riser pipe into the well. Turned the pump off and contacted Thein Well. They removed the lift system and replaced sections of riser pipe. Restarted the pump and observed normal operation.

Down time: 22 hours.

8/3/2019 Treatment System and Well Field. Site wide power outage. Contacted Xcel Energy and turned off the extraction wells. Xcel repaired the problem. Turned the wells back on and reset the PLC in Building 116. The TGRS restarted normally.

Down time: 4 hours at B1; 3.5 hours at B6 and B9; 3 hours at B13 and SC5; 2 hours at B3, B8 and SC1.

9/28-29/2019 Pumphouses B1, B13, B5, B6, B8, B9, SC1 and SC5. The pumps were off. Troubleshooting indicated that the high float in Wet Well 2 was activated. Pumped the water from the VAP study out of the wet well and the pumps came back on normally.

Down time: 13 hours at B1. 19.5 hours at B5. 24 hours at B8. 25 hours at B13. 24.5 hours at SC5. 25.5 hours at B6. 26 hours at B9 and SC1.

#### Pumphouse B9

10/3/2018 Pumphouses B9. The light was flashing on the well field panel. At the pumphouse, the pump was off. Reset the controls and turned the control switch to auto. The pump started normally.

Down time: 5.5 hours.

10/4/2018 Pumphouse B9. The light was flashing on the well field panel. Reset the PLC and the light came on normally. At the pumphouse the pump was operating normally. Down time: 15 hours.

# Maintenance Activities By Location Fiscal Year 2018 TGRS, OU2 Arden Hills, Minnesota

10/31/2018 Treatment System. Removed, cleaned and replaced the demister pads in towers 3 and 4. To minimize well field cycling, turned the pumps in B6 and B9 to off. After completion of the work, turned the pumps on at B6 and B9 and observed normal operation.

Down time: 2 hours of down time occurred at B9 on 10/31/2018, but the down time will be reported on 11/1/2018 because the daily inspection had already been performed prior to the work on 10/31/2018.

11/1/2018 Treatment System. Removed, cleaned and replaced the demister pads in towers 3 and 4. Turned pumps B6 and B9 off to minimize well field cycling. Following the work, turned the pumps back on and observed normal operation.

Down time: 2 hours at B9.

11/21-30/2018 Treatment System: The pump shaft for Pump 4 was wobbling and spraying water out the gland packing. Thein Well on site to assess the condition of the pump. They pulled the pump and brought it in to be rebuilt. Turned pumps B3 and B9 off to minimize well field cycling with only Pump 3 in the treatment center operating. They reinstalled the pump and turned the pump on. The pump operated normally. Following the work, turned the pumps on in B3 and B9 and observed normal operation. SC1 cycled on and off during the work.

Down time: 92.5 hours at B3, 96 hours at B9, and 36.5 hours at SC1.

2/3/2019 Pumphouse B4. One of the phases of the drop line from the power pole to the pumphouse was shorting out to the support cable. Contacted Xcel and they responded. Shutdown pumphouses B5, B6, and B9 and Xcel opened the fusible links on the power pole behind B5. Xcel replaced/spliced 2 of the wires and repaired the neutral cable to the building. Turned B4 back on and observed normal operation. Turned pumphouses B5, B6 and B9 back on and observed normal operation.

Down time: None (the extraction wells met their required daily flow rates for the day).

2/14-18/2019 Pumphouse B9. The pump was off upon arrival. Troubleshooting indicated a communication issue. Turned the pump on in "Hand" to minimize down time. Replaced the communication cards in the control panel with new from inventory and restarted the pump. The pump restarted normally and observed normal operation.

Down time: 22.5 hours.

6/13/2019 Pumphouses B1, B13, B3, B4, B5, B6, B8 and B9. Power outage. Contacted Xcel Energy. They replaced a fuse on a power pole near B8. Restarted the wells and observed normal operation.

Down time: 2.5 hours at B1, B13 and B9 and 3 hours at B4.

# Maintenance Activities By Location Fiscal Year 2018 TGRS, OU2 Arden Hills, Minnesota

6/24-26/2019 Pumphouse B9. There was a hole in the upstream elbow of the RPZ backflow preventer. Turned the pump off and contacted Jayhawk Mechanical. They replaced the elbow with a new one from inventory. Down time: 54 hours. 7/3/2019 Treatment System. Changed the oil in Pump 4. Turned off wells B6 and B9 to minimize well field cycling with only Pump 3 operating. Following the work, restarted Pump 4 and observed normal operation. Turned B6 and B9 back on for normal oneration Down time: 2 hours each at B6 and B9 7/3/2019 Treatment System. Pump 3 would not start in Auto. Turned the well field off and inspected the Pump 3 start and stop floats in Wet Well 3. The Pump 3 stop float was broken. Replaced the float and restarted the treatment system and well field in auto. Pump 3 started in Auto normally. Down time: 1 hour at B6, 1.5 hours at B13 and B9 and 2 hours at B1. 8/1/2019 Treatment System. ECV 4 would not close. Removed and replaced portions of ECV 4's control piping. Cycled the valve and observed normal operation. Turned off wells B6 and B9 to minimize well field cycling with only Pump 3 operating. Down time: 5 hours at B6 and B9. 8/3/2019 Treatment System and Well Field. Site wide power outage. Contacted Xcel Energy and turned off the extraction wells. Xcel repaired the problem. Turned the wells back on and reset the PLC in Building 116. The TGRS restarted normally. Down time: 4 hours at B1; 3.5 hours at B6 and B9; 3 hours at B13 and SC5; 2 hours at B3, B8 and SC1. 8/7/2019 Pumphouse B9. The light was off on the well field panel. At the pumphouse the pump was off and the pump would pump in Hand but not in Auto. Troubleshooting indicated a blown I/O adapter module. Replaced the module and the pump restarted normally. Down time: 16 hours. 8/26/2019 Treatment System. ECV 2 would not open. Replaced portions of the control piping. Cycled the valve and observed normal operation. Turned off B1, B9 and SC1 during the work to minimize well field cycling.

Down time: 1 hour at B1 and SC1; 2 hours at B9.

# Maintenance Activities By Location Fiscal Year 2018 TGRS, OU2 Arden Hills, Minnesota

9/11-12/2019 Pumphouses B1, B13, B6, B9 and SC1. Turned the pumps off to remove and clean the demister pads. Also, turned the TGRS off while MidAmerica inspected the condition of the packing and water distribution systems in Towers 3 and 4. Following the work, turned the TGRS back on and observed normal operation.

Down time: 2 hours at B1, B13 and SC1. 2.5 hours at B6 and B9.

9/14/2019 Pumphouses B1, B13, B6 and B9. The pumps were not pumping and there was minimal power to the pumphouses. Contacted Xcel Energy. They replaced two fuses and an arrester on the power poles near old Gate 4. Following the repair, turned the TGRS on and observed normal operation.

Down time: 1.5 hours at B1 and B13. Two hours at B6 and B9.

9/28-29/2019 Pumphouses B1, B13, B5, B6, B8, B9, SC1 and SC5. The pumps were off. Troubleshooting indicated that the high float in Wet Well 2 was activated. Pumped the water from the VAP study out of the wet well and the pumps came back on normally.

Down time: 13 hours at B1. 19.5 hours at B5. 24 hours at B8. 25 hours at B13. 24.5 hours at SC5. 25.5 hours at B6. 26 hours at B9 and SC1.

#### Pumphouse B13

11/9/2018 Pumphouse B1: The pump would not run in Auto. Swapped I/O adapter cards with B13 but the pump still did not run in Auto. Turned the controls to Hand and the pump started. Additional troubleshooting necessary.

Down time: None.

- 1/11/2019 Pumphouses B6 and B13. Increased the flow rates slightly. Down time: None.
- 1/16/2019 Pumphouses B6 and B13. Increased the flow rates slightly again. Down time: None.

# Maintenance Activities By Location Fiscal Year 2018 TGRS, OU2 Arden Hills, Minnesota

6/13/2019 Pumphouses B1, B13, B3, B4, B5, B6, B8 and B9. Power outage. Contacted Xcel Energy. They replaced a fuse on a power pole near B8. Restarted the wells and observed normal operation.

Down time: 2.5 hours at B1, B13 and B9 and 3 hours at B4.

7/3/2019 Treatment System. Pump 3 would not start in Auto. Turned the well field off and inspected the Pump 3 start and stop floats in Wet Well 3. The Pump 3 stop float was broken. Replaced the float and restarted the treatment system and well field in auto. Pump 3 started in Auto normally.

Down time: 1 hour at B6, 1.5 hours at B13 and B9 and 2 hours at B1.

8/3/2019 Treatment System and Well Field. Site wide power outage. Contacted Xcel Energy and turned off the extraction wells. Xcel repaired the problem. Turned the wells back on and reset the PLC in Building 116. The TGRS restarted normally.

Down time: 4 hours at B1; 3.5 hours at B6 and B9; 3 hours at B13 and SC5; 2 hours at B3, B8 and SC1.

9/11-12/2019 Pumphouses B1, B13, B6, B9 and SC1. Turned the pumps off to remove and clean the demister pads. Also, turned the TGRS off while MidAmerica inspected the condition of the packing and water distribution systems in Towers 3 and 4. Following the work, turned the TGRS back on and observed normal operation.

Down time: 2 hours at B1, B13 and SC1. 2.5 hours at B6 and B9.

9/14/2019 Pumphouses B1, B13, B6 and B9. The pumps were not pumping and there was minimal power to the pumphouses. Contacted Xcel Energy. They replaced two fuses and an arrester on the power poles near old Gate 4. Following the repair, turned the TGRS on and observed normal operation.

Down time: 1.5 hours at B1 and B13. Two hours at B6 and B9.

9/28-29/2019 Pumphouses B1, B13, B5, B6, B8, B9, SC1 and SC5. The pumps were off. Troubleshooting indicated that the high float in Wet Well 2 was activated. Pumped the water from the VAP study out of the wet well and the pumps came back on normally.

Down time: 13 hours at B1. 19.5 hours at B5. 24 hours at B8. 25 hours at B13. 24.5 hours at SC5. 25.5 hours at B6. 26 hours at B9 and SC1.

9/30/2019 Pumphouse B13. The ECV closed slightly decreasing the flow rate overnight. Cleaned the strainer screen and flushed the control piping. Restarted the pump and observed normal operation.

Down time: 14 hours.

# Maintenance Activities By Location Fiscal Year 2018 TGRS, OU2 Arden Hills, Minnesota

#### Pumphouse SC1

11/7/2018	Pumphouses SC1 and B11: The existing pumphouse heaters would not produce heat. Placed temporary electric heaters in the pumphouses and scheduled Preferred Electric.

Down time: None.

- 11/15/2018 Pumphouse SC1: Preferred Electric repaired the electric heater. Down time: None.
- 11/21-30/2018 Treatment System: The pump shaft for Pump 4 was wobbling and spraying water out the gland packing. Thein Well on site to assess the condition of the pump. They pulled the pump and brought it in to be rebuilt. Turned pumps B3 and B9 off to minimize well field cycling with only Pump 3 in the treatment center operating. They reinstalled the pump and turned the pump on. The pump operated normally. Following the work, turned the pumps on in B3 and B9 and observed normal operation. SC1 cycled on and off during the work.

Down time: 92.5 hours at B3, 96 hours at B9, and 36.5 hours at SC1.

2/26-28/2019 Pumphouse SC1. The flow meter stopped totaling. Removed the flow meter and cleaned the body and impellars. Reinstalled the meter and turned the pump on. Normal operation observed.

Down time: 2 hours. Meter readings were estimated.

3/14/2019 Pumphouse SC1. Localized flooding caused approximately 2" of standing water on the pumphouse floor.

Down time: None.

5/20-21/2019 Pumphouse SC1. The flow meter stopped totaling. Removed the flow meter, cleaned the meter with acid and reinstalled the meter. Restarted the pump and observed normal operation. Meter readings were estimated.

Down time: None.

6/15-24/2019 Pumphouse SC1. The flow meter stopped totaling. Removed the flow meter and cleaned it with muriatic acid. Reinstalled the flow meter and observed normal operation.

Down time: None. Meter readings were estimated.

#### Appendix <.3

# Maintenance Activities By Location Fiscal Year 2018 TGRS, OU2 Arden Hills, Minnesota

8/3/2019 Treatment System and Well Field. Site wide power outage. Contacted Xcel Energy and turned off the extraction wells. Xcel repaired the problem. Turned the wells back on and reset the PLC in Building 116. The TGRS restarted normally.

Down time: 4 hours at B1; 3.5 hours at B6 and B9; 3 hours at B13 and SC5; 2 hours at B3, B8 and SC1.

8/9-13/2019 Pumphouse SC1. The flow meter was not totaling. Removed, cleaned and replaced the flow meter. The meter began totaling normally.

Down time: None. Meter readings were estimated.

8/26/2019 Treatment System. ECV 2 would not open. Replaced portions of the control piping. Cycled the valve and observed normal operation. Turned off B1, B9 and SC1 during the work to minimize well field cycling.

Down time: 1 hour at B1 and SC1; 2 hours at B9.

9/11-12/2019 Pumphouses B1, B13, B6, B9 and SC1. Turned the pumps off to remove and clean the demister pads. Also, turned the TGRS off while MidAmerica inspected the condition of the packing and water distribution systems in Towers 3 and 4. Following the work, turned the TGRS back on and observed normal operation.

Down time: 2 hours at B1, B13 and SC1. 2.5 hours at B6 and B9.

9/28-29/2019 Pumphouses B1, B13, B5, B6, B8, B9, SC1 and SC5. The pumps were off. Troubleshooting indicated that the high float in Wet Well 2 was activated. Pumped the water from the VAP study out of the wet well and the pumps came back on normally.

Down time: 13 hours at B1. 19.5 hours at B5. 24 hours at B8. 25 hours at B13. 24.5 hours at SC5. 25.5 hours at B6. 26 hours at B9 and SC1.

#### **Pumphouse SC2**

#### Pumphouse SC5

12/18/2018 Pumphouse SC5. The flow meter was not operating properly. Changed out the flow meter with a new one from inventory and opened the ECV all the way to maximize the flow rate.

Down time: None.

5/21/2019 Pumphouse SC5. The ECV would not actuate properly. Locked the valve open and removed the control piping. Additional work rebuilding the control piping will be necessary.

Down time: 2 hours.

# Maintenance Activities By Location Fiscal Year 2018 TGRS, OU2 Arden Hills, Minnesota

5/28/2019	Pumphouse SC5. The RPZ was leaking. Turned the pump off and exercised the valves. Restarted the pump and observed normal operation.
	Down time: 1.5 hours.
6/4-5/2019	Pumphouse SC5. The flow meter stopped totaling. Replaced the flow meter with one from inventory.
	Down time: None. Meter readings were estimated.
8/3/2019	Treatment System and Well Field. Site wide power outage. Contacted Xcel Energy and turned off the extraction wells. Xcel repaired the problem. Turned the wells back on and reset the PLC in Building 116. The TGRS restarted normally.
	Down time: 4 hours at B1; 3.5 hours at B6 and B9; 3 hours at B13 and SC5; 2 hours at B3, B8 and SC1.
8/4/2019	Pumphouse SC5. The ECV closed slightly overnight. Replaced the strainer screen and flushed the control piping. Cycled the ECV and observed normal operation. Down time: 1.5 hours.
8/6/2019	Pumphouse SC5. The light was flashing on the well field panel. Reset the PLC and the light came on normally. At the pumphouse, the pump was operating normally. Down time: 24 hours.
8/12-17/2019	Pumphouse SC5. Turned the pump off to redevelop the well. Also, replaced the pump and motor. Following the work, turned the pump on and observed normal operation. Down time: 93.5 hours.
9/1/2019	Pumphouse SC5. Turned the pump off and replaced portions of the control piping on the ECV. Following the work, turned the pump on and set the flow rate to 80 gpm. Down time: 3.5 hours.
9/11/2019	Pumphouse SC5. The light was flashing on the well field panel. Reset the PLC and the light came back on steady. At the pumphouse, the pump was operating normally. Down time: 5.5 hours.
9/28-29/2019	Pumphouses B1, B13, B5, B6, B8, B9, SC1 and SC5. The pumps were off. Troubleshooting indicated that the high float in Wet Well 2 was activated. Pumped the water from the VAP study out of the wet well and the pumps came back on normally.
	Down time: 13 hours at B1. 19.5 hours at B5. 24 hours at B8. 25 hours at B13. 24.5 hours at SC5. 25.5 hours at B6. 26 hours at B9 and SC1.

# Maintenance Activities By Location Fiscal Year 2018 TGRS, OU2 Arden Hills, Minnesota

#### **Treatment System**

10/17/2018	Treatment System. Cleaned the blower intake screens for towers 3 and 4. Down time: None.
10/31/2018	Treatment System. Removed, cleaned and replaced the demister pads in towers 3 and 4. To minimize well field cycling, turned the pumps in B6 and B9 to off. After completion of the work, turned the pumps on at B6 and B9 and observed normal appraction
	Down time: 2 hours of down time occurred at B9 on 10/31/2018, but the down time will be reported on 11/1/2018 because the daily inspection had already been performed prior to the work on 10/31/2018.
11/1/2018	Treatment System. Removed, cleaned and replaced the demister pads in towers 3 and 4. Turned pumps B6 and B9 off to minimize well field cycling. Following the work, turned the pumps back on and observed normal operation.
	Down time: 2 hours at B9.
11/21-30/2018	Treatment System: The pump shaft for Pump 4 was wobbling and spraying water out the gland packing. Thein Well on site to assess the condition of the pump. They pulled the pump and brought it in to be rebuilt. Turned pumps B3 and B9 off to minimize well field cycling with only Pump 3 in the treatment center operating. They reinstalled the pump and turned the pump on. The pump operated normally. Following the work, turned the pumps on in B3 and B9 and observed normal operation. SC1 cycled on and off during the work.
	Down time: 92.5 hours at B3, 96 hours at B9, and 36.5 hours at SC1.
1/9/2019	Treatment System. Turned Pump 4 off to change the motor oil and grease the lower bearings. Turned the pumps in B5 and B8 off during the work to minimize well field cycling with only Pump 3 in the treatment center operating. Following the work, restarted Pump 4 and observed normal operation. Turned the pumps in B5 and B8 back to on and observed normal operation.
	Down time: None.
1/24/2019	Treatment System. The valve stem and drain lines for ECV 4 were leaking. Removed

and replaced the valve stem packing and tightened the valve stem bushing. Also, replaced the ECV control piping drain lines. Following the work, the valve stem and drain lines no longer leaked.

Down time: None.

# Maintenance Activities By Location Fiscal Year 2018 TGRS, OU2 Arden Hills, Minnesota

2/26/2019 Treatment System. ECV 3 would not close on command. Removed and replaced portions of the control piping. Turned Pump 3 on and exercised the valve several times. The valve closed normally.

Down time: None.

- 3/6/2019 Treatment System. ECV 4 was closing slowly. Exercised the control valves on the control piping and removed and cleaned the check valves on the control piping. Down time: None.
- 3/8/2019Treatment System. ECV 3 would not close all the way. Removed and cleaned the<br/>check valves and exercised the control valves and the valve body.

Down time: None.

3/18/2019Treatment System. The coil on the emergency solenoid at ECV 4 was buzzing.<br/>Removed and replaced the solenoid valve body and coil.

Down time: None.

- 7/3/2019 Treatment System. Changed the oil in Pump 4. Turned off wells B6 and B9 to minimize well field cycling with only Pump 3 operating. Following the work, restarted Pump 4 and observed normal operation. Turned B6 and B9 back on for normal operation Down time: 2 hours each at B6 and B9
- 7/3/2019 Treatment System. Pump 3 would not start in Auto. Turned the well field off and inspected the Pump 3 start and stop floats in Wet Well 3. The Pump 3 stop float was broken. Replaced the float and restarted the treatment system and well field in auto. Pump 3 started in Auto normally.

Down time: 1 hour at B6, 1.5 hours at B13 and B9 and 2 hours at B1.

8/1/2019 Treatment System. ECV 4 would not close. Removed and replaced portions of ECV 4's control piping. Cycled the valve and observed normal operation. Turned off wells B6 and B9 to minimize well field cycling with only Pump 3 operating.

Down time: 5 hours at B6 and B9.

8/3/2019 Treatment System and Well Field. Site wide power outage. Contacted Xcel Energy and turned off the extraction wells. Xcel repaired the problem. Turned the wells back on and reset the PLC in Building 116. The TGRS restarted normally.

Down time: 4 hours at B1; 3.5 hours at B6 and B9; 3 hours at B13 and SC5; 2 hours at B3, B8 and SC1.

# Maintenance Activities By Location Fiscal Year 2018 TGRS, OU2 Arden Hills, Minnesota

8/26/2019 Treatment System. ECV 2 would not open. Replaced portions of the control piping. Cycled the valve and observed normal operation. Turned off B1, B9 and SC1 during the work to minimize well field cycling.

Down time: 1 hour at B1 and SC1; 2 hours at B9.

# APPENDIX =

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#### 5 DD9 B8 =L 1'%





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#### **EXTRACTION WELL B5 - TCE VS. TIME**



Note: Samples reporting concentrations less than the detection limit were plotted as zero.

#### **EXTRACTION WELL B6 - TCE VS. TIME**



Note: Samples reporting concentrations less than the detection limit were plotted as zero.

#### **EXTRACTION WELL B8 - TCE VS. TIME**



Note: Samples reporting concentrations less than the detection limit were plotted as zero.

#### **EXTRACTION WELL B9 - TCE VS. TIME**



Note: Samples reporting concentrations less than the detection limit were plotted as zero.





Note: Samples reporting concentrations less than the detection limit were plotted as zero.

#### **EXTRACTION WELL B13 - TCE VS. TIME**



Note: Samples reporting concentrations less than the detection limit were plotted as zero.

#### **EXTRACTION WELL SC1 - TCE VS. TIME**



Note: Samples reporting concentrations less than the detection limit were plotted as zero.

#### **EXTRACTION WELL SC5 - TCE VS. TIME**



Note: Samples reporting concentrations less than the detection limit were plotted as zero.

#### Influent/Effluent Database Fiscal Year 2019 TGRS, OU2 Arden Hills, Minnesota

			1,1,1-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	cis-1,2-Dichloroethene	Tetrachloroethene	Trichloroethene
	I GRS CI	eanup Level	200	70	6.0	4.0	70	5.0	5.0
Location	Date		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
TGRSE	10/8/2018		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.9
TGRSE	10/8/2018	D	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	2.0
TGRSE	11/6/2018		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.8
TGRSE	11/6/2018	D	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	2.0
TGRSE	12/4/2018		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.9
TGRSE	12/4/2018	D	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.9
TGRSE	1/8/2019		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	2.2
TGRSE	2/4/2019		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	2.0
TGRSE	2/4/2019	D	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	2.2
TGRSE	3/5/2019		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	2.1
TGRSE	3/5/2019	D	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	2.2
TGRSE	4/8/2019		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	2.0
TGRSE	4/8/2019	D	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	2.1
TGRSE	5/2/2019		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.9
TGRSE	6/12/2019		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.9
TGRSE	6/12/2019	D	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.9
TGRSE	7/17/2019		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.8
TGRSE	7/17/2019	D	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.9
TGRSE	8/7/2019		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.7
TGRSE	8/7/2019	D	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.7
TGRSE	9/6/2019		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	2.4

#### Influent/Effluent Database Fiscal Year 2019 TGRS, OU2 Arden Hills, Minnesota

			1,1,1-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	cis-1,2-Dichloroethene	Tetrachloroethene	Trichloroethene
	TGRS CI	eanup Level <sup>(1)</sup>	200	70	6.0	4.0	70	5.0	5.0
Location	Date		μg/L	μg/L	µg/L	μg/L	µg/L	μg/L	μg/L
TGRSI	10/8/2018		34.0	1.8	2.7	< 1.0	3.0	1.3	170
TGRSI	11/6/2018		39.0	2.3	3.2	< 1.0	3.4	1.3	200
TGRSI	12/4/2018		39	2.4	3.2	< 1.0	3.3	1.2	200
TGRSI	1/8/2019		46	2.4	3.6	< 1.0	3.5	1.1	230
TGRSI	1/8/2019	D	45	2.3	3.4	< 1.0	3.3	1.1	240
TGRSI	2/4/2019		44	2.3	3.4	< 1.0	3.2	1.2	220
TGRSI	3/5/2019		36	2.6	2.8	< 1.0	3.3	0.97 JP	200
TGRSI	4/8/2019		40	2	3.1	< 1.0	2.9	1.3	190
TGRSI	5/2/2019		35	1.9	2.7	< 1.0	2.8	1.1	180
TGRSI	5/2/2019	D	35	1.9	2.8	< 1.0	2.8	1.1	180
TGRSI	6/12/2019		26	2	2	< 1.0	2.9	0.79 JP	150
TGRSI	7/17/2019		25	1.8	1.9	< 1.0	2.8	0.91 JP	150
TGRSI	8/7/2019		28	1.9	2.3	< 1.0	3.1	0.96 JP	160
TGRSI	9/6/2019		47	2.5	3.6	< 1.0	3.2	1.1	210
TGRSI	9/6/2019	D	50	2.6	3.7	< 1.0	3.5	1.3	220

#### Notes:

<sup>(1)</sup> Cleanup levels for TGRS are from the OU2 ROD.

- D Field Duplicate
- MDL Method Detection Limit
- RL Reporting Limit
- JP Result is qualified as estimated since the detection is below the laboratory reporting limit

## **APPENDIX J**

**Maros Decision Matrix** 



## Appendix J

## Table J.1 Maros Decision Matrix

		Coefficient of	
Kendall S	Confidence	Varience	Trend
S > 0	> 95%	NA	Definitely Increasing
S > 0	90-95%	NA	Probably Increasing
S > 0	< 90%	NA	No Trend
S = 0</td <td>&lt; 90%</td> <td>&gt;/= 1</td> <td>No Trend</td>	< 90%	>/= 1	No Trend
S = 0</td <td>&lt; 90%</td> <td>&lt; 1</td> <td>Stable</td>	< 90%	< 1	Stable
S < 0	90-95%	NA	Probably Decreasing
S < 0	>95%	NA	Definitely Decreasing

# Table I.2Confidence Values for Six Data Pairs

Kendall S	Confidence			
1	50.00%			
3	64.00%			
5	76.50%			
7	86.40%			
9	93.20%			
11	97.20%			
13	99.17%			
15	99.86%			

#### WELL 03M848 MANN-KENDALL STATISTICAL ANALYSIS OU3 - 2019

Date	TCE (µg/l)	Mar	n-Kendall C	alculation:						
6/9/2014	150	1								
6/11/2015	130	1	-1							
6/14/2016	110	1	-1	-1						
6/8/2017	100	1	-1	-1	-1					
6/28/2018	110	1	-1	-1	0	1				
6/20/2019	100	1	-1	-1	-1	0	-1			
1	N	6	5	4	3	2	1	0		15
		sum	-5	-4	-2	1	-1	0	Kendall S	-11
F	Possibles	15								

Kendall tau -0.733



Raw Data

Mean

COV

Trend:

Confidence (lookup)

STNDEV

116.67

19.6638

0.1685

03M848	Date	TCE	Date	TCE
	12/2/1987	440	6/1/2003	450
	4/19/1990	190	6/21/2005	230
	7/19/1990	190	6/13/2006	190
	9/17/1990	330	6/21/2007	150
	3/18/1991	310	6/18/2008	130
	6/4/1991	730	6/17/2009	130
	9/3/1991	700	6/8/2010	130
	3/18/1992	640	6/24/2011	150
	6/3/1992	>50.10	6/24/2011	160 D
	6/3/1992	570 D	6/1/2012	190
	9/3/1992	>50.10	6/1/2012	180 D
	3/9/1993	1300	6/27/2013	160
	3/9/1993	970 D	6/9/2014	150
	3/17/1994	910	6/9/2014	150 D
	3/16/1995	59	6/11/2015	130
	6/21/1996	1400	6/14/2016	110
	6/26/1997	510	6/14/2016	110 D
	6/29/1998	660	6/8/2017	100
	6/4/1999	700	6/28/2018	110
	6/4/1999	650 D		



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