

Royal Veterinary



University ●n



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T-!\|\)/2' /!Y!45,6')77)8,'7\$"-3'1%#+%\$&'2009'1+;&'203Z!

#\$%&,&V' /!P-YV]!\|\!V!!&' 2>360T d(Y)12.5-1(!5)12.2E32(')-1(/)-1(!)4(P-!)7(())4(P-!)&*)-2!V6' 671d(!)Tj/TT31T8%(!)4(P-!)*7%_3(O)35(P3(

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B' -!, \$%!(%) -!%/6%6!<"!U9*(!8K"K!

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+8<?G9JB<FG8

#\$\$.2!-%; ' -,-!-%; -%2%/ ,2!)/!) /)^*(2.2! ' B!, \$%!)@, .5. ,-%2! ' B!, \$%&' ()!+%, %-./)-(!0' **%1%!1-' 9; !B-' D!, \$%!; %-2; %@, .5%! ' B!, \$%!T%D?%-2! ' B!, \$%!
0' 9/@.*! ,2!1' 5%-./!1?' 6(!#\$\$! ./B' -D), ' /!\$%-./!@' D; *%D%/ ,2!)/6!29; ; *%D%/ ,2! , \$%! ./B' -D), . /! ./! , \$%! B./)/@.)!2,) , %D%/ ,2d!
b\$.*2!,!,!\$)2!)!B' -Q)-6!*' '].

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"%\$(0/%\$%R0!%\$H8%"/,./9%6X!
B' -!, \$%!(%) -!/6%6!<"!U9*(!8K"K!

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#\$\$!0' 9/@.!'\$)2!./!; *)@!D%@\$)/.2D2!, ' !%/29-%!, \$),!)**! B!.,2!; ' *@.2!)/6!; -' @%69-%2!@' D; *(IQ., \$!, \$%-!-%5)/,!'1.2*), ' /!Q\$.@\$!
./@*96%23!

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i A' -6%-2!0.,,j%/2\$.;!)/6!JDD.1-),./ /!7@,!8KKI h!
i 0\$)-.,.%2!7@,!8KKFh!
i 0' -; ' -),%!T)/2*)91\$,%-!)/6!0' -; ' -),%!V' D.@.6%!7@,!8KKGH!
i \),!)!>-',%@.,./!7@,!'! I Hh!
i Lk9)*.,(17@,!8K"Kh!
i P-%%6' D!' B!J/B' -D),./ /!7@,!8KKKh!
i V%)*,\$!)/6!C)B%,(17@,!'! I GEh!
i V9D)/!&.1\$,2!7@,!'! I Hh!)/6!
i f_A' -6%-2!7@,!8KKGh!

!>-' @%22%2!)-%! *2' !./!; *)@!,' !%/29-%!, \$),!)**!/%Q!*1.2*),.5%!-%k9.-%D%/2!)-!@' /2.6%-6!, ' !%/29-%!, \$),!'Q\$-%!-%5)/,!'1,\$%!0' **%1%!
@' D; *%2!B9**(!Q., \$!, \$%!)Qd!

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H:?IG?=E8B:#+89FBEkG?@

#\$\$!0' **%1!@9--%/,*(!D%)29-%2!,2!; %-B' -D)/@!?(1-%B%--/1!, ' !; -' 1-%22!D)6%!1)./2!, \$%!](12,-),%1.@! ' ?g%@, .5%2!1.5%/!Q., \$./!.,2!
0' -; ' -),%!>*)/d!#!\$\$%2!)-%! /', %6!?'* Qd!

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#\$\$!0' **%1!\$)2!)6'; %6!, \$%! 0' DD.,,%! B! f/.5%-2.,(10\$).-D%/2! W0FOX! 19.6)/@!' /!_(!>-%B' -D)/@! J/6.@), ' -2!; 9?*2.\$%6!./!
S' 5%D?%-!8KKF!#!\$!>J2!B' -!, \$%! 0' **%1!)-%3!

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¥ J/2.,.9.,./)!292,.)?)?.,(!
¥ 7@)6%D.@!; -' B.*%!) /6!D)-]%,!; ' 2.,./!
¥ #\$\$!2,96%/!%M; %-.%/@%!) /6!,%)\$./1!N!*%)-./1!
¥ &%2%)-@\$!
¥ 0'./@)*!)@.,.5.,.%2!
¥ _/' Q*%61%!, -)/2B%-!)/6!-%*),./ /2\$.; 2!
¥ P./)/@.)*!\$%)*,\$!
¥ L2,)%2!)/6!./B-)2,-9@,9-%!
¥ C,)BB!)/6!\$9D)/!-%2' 9-@%16%5%* ; D%/!,
¥ 4' 5%-)/@%!*%6%2\$.; !)/6!D)/1%D%/!,
¥ J/2.,.9.,./)!; -' g%@,2!

7; ; -; -),%!29; ; ' -,./1!>J2!\$)5%!?%%/!)1-%%6!B' -!%)@!' B!, \$%!%5%5%/!>J2!1.5%!?)?' 5%#!#!\$%2!29; ; ' -,./1!>J2!)-%!*./]!%6!6.-%@,*(!
./,!'!,\$%!'?g%@, .5%2!Q., \$./!, \$%! 0' **%1%:2!0' -; ' -),%!>*)/!) /6!)-!Q%.1\$, %6!)/6!29DD),%6!, ' !1.5%!)/!' 5%-)**!(-),./1:1B' -!, \$%!%5%5%/!
_>J2!92./1!)!,-)BB.@=.1\$.:!@' ** 9-./1!2(2,%Dd!

!
#\$\$!0' 9/@.!'\$)2!)22%22%6!; %-B' -D)/@!B' -!8KKI="K!)1)./2!, \$%2%!/6.@), ' -2!)2!2%,!' 9,!?'* Qd!
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"%\$(0/%\$%R0!%\$H&9%/,./9%6X!

B' -!, \$%!(%) -!/6%6!<"!U9*(!8K"K!

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LM@%**%/@%!./!0*./@)*!C%-5.@%2!

<p>4' ' 6!; -' 1-%22!</p> <p>¥ T)-]%,./1!2,-),%1('B./)/@)*!-%; ' -./1!)/6!_>J2! B9-,\$%-16%5%*'; %6^!;)-,@9*)-(!B' @92%6!' /!, \$%!e9%%/! T', \$%-!V' 2; ..)'B' -!7/.D)*2!)/6!, \$%!A%)9D' /,! C)./2?9-(!7/.D)*2:!V' 2; ..)'! ¥ P)-D!)/.D)!,%>@\$. /!!)!, \$%!b%*2\$!&%1.' /)*! +%,%-. /)-(10' **%1%!\$)2!7%%/!2,-%/1, \$%/ %6!?(!, \$%!); ; ' ./, D%/ ,!' B!)/!)66.,.' /)*5%,%-. /)-) /! ¥ C9@@%22B9*!@' D; *,.,' /!' B!-%=6%5%*' ; D%/ ,!' B!, \$%! Lk9./%&%B%--)*!V' 2; ..)'! ,!, \$%!V)Q]2\$%)6!0)D; 92! ¥ T)g' -!-%89-?.2\$D%/ ,!' B!, \$%!A%)9D' / ,!C)./2?9-(! 7/.D)*2:!V' 2; ..)'! 5%-!29DD%-!8K"K! ¥ J/@-%)2%!./!@)2%*')6!)/6!@*./@)*!./@' D%!@-' 22!)*! 9/.,2!' B!, \$%!0*./@)*!C%-5.@%2!\.5.2.' /!W"Kml' /!)5%-)1%X!</p>	<p>C' Q%-!; -' 1-%22!</p> <p>¥ \%*)(!./B./)*.2./1)1-%%1T f0.004; cs0%T.8008.8K</p>
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"%\$(0/%\$%R0!%\$H8%"/,./9%6X!

B' -!, \$%! (%) -!%/6%6!<"!U9*(18K"K!

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L/) ?*./1!%M@%**%/@%!

<p>4' ' 6!; -' 1-%22!</p> <p>#%#</p> <p>¥ \ %5%*' ; D%/ ,!' B!)/!D; -' 5%6!2,) BB!-%Q)-6!B-) D%Q' -] ^!</p> <p>./@*96./1!LM,%/6%6!C*)-(!&)/1%2^!C; %@.)^!7Q)-6!)/6!</p> <p>&%@' 1/.,.' /!2@D%2!</p> <p>¥ \ %5%*' ; D%/ ,!' B!)/!)@)6%D.@!2,) BB!0>\!B-) D%Q' -] !=!</p> <p>, ' !?%!D; *%D%/,%6!/!8K" ""!</p> <p>¥ Lk9)*, (IC,-), %1(!b' -]./!14-' 9; !6%5%*' ; %6!)!C./1%!</p> <p>Lk9)*, (IC@D%Q\$.@!Q)2!); ; -' 5%6!?(!, \$%!O' **%1%!</p> <p>O' 9/@.*!./!U9/%!8K"K!</p> <p>!</p>	<p>C*' Q%-!; -' 1-%22!</p> <p>#%#</p> <p>¥ \ %5%*' ; D%/ ,!' B!Lk9)*, (IJD;)@, !722%22D%/ ,2!</p> <p>!</p>
<p>.GT:?8E8B!</p> <p>¥ \ %1-%!)Q)-6./1!; ' Q%-2!1-)/,%6!?(!, \$%!>-.5(!0' 9/@.*!</p> <p>¥ C9@@%22B9*15.2,) ,.' /!B-' D!, \$%!&' ()^!O' **%1%!' B!</p> <p>+%,%-. /)-(IC9-1%' /2!)/6!, \$%!L9-' ; %)/!722' @.) ,.' /!' B!</p> <p>L2.)?*.2SD%/ ,2!' B!+%,%-. /)-(!L69@) ,.' /!./!Q\$.@!\$!</p> <p>; -' 5.2.' /)^!B9**!-%@' 1/.,.' /!)/6!/' !6%B.@./@.2!1.5%/!</p> <p>¥ &%5.2.' /2!, ' !2,) ,9,%2!-%*) ,./1!, ' !D; *' (D%/ ,!</p> <p>-%19*) ,.' /2!</p> <p>¥ LM,%/2.' /!' B!, \$%!D%D?%-2\$.; !' B!, \$%!796.,!O' DD.,,%%</p> <p>, ' !?%, %1-%B*%@, !, \$%!@ ,.5., %2!' B!, \$%!O' **%1%!4-' 9; ^!</p> <p>./@*96./1!, !2!29?2.6.)-(!@' D;)/,%2!</p> <p>!</p>	<p>.GT:?8E8B!</p>

\$@<E<:@

¥ L2,) %!C,-), %1(!D; *%D%/,%6!)/6!1')^2!-%19*)-(!

D' /.,' -%6!

¥ C.1/B.@)/,; -' 1-%22!./!-%*) ,.' /!, ' !%/5.-' /D%/ ,)^!

292,.) /) ?*., (^!)2!%5.6%/@%6!?(!D)g' -!D; -' 5%D%/ ,!./!

14-%%/;!f/.5%-2., (!%)19%!,) ?*%!

¥ b' -]./1!, ' Q)-62!VLPOL!1' ' 6!; -)@.,@%!19.6%*. /%2!

%5.6%/@%6!?(!); ; -' 5)!B' -!!*.1\$, =, ' 9@!\$;!0); ,.)^!

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"%\$(0/%\$%R0!%\$H8%"/,./9%6X!
B' -!, \$%!(%) -!/6%6!<"!U9*(!8K"K!

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H?F8BF;EA!%F@M@!E89!8B: ?<EF8<F: @

#\$%I0' **%1!(\$2!)!@' D; -%\$/2.5%2, -), %1.@!-2]!-1.2, %-^, \$-' 91\$IQ\$.@\$12%/.' -!D)/)1%D%/ ,!) /6!, \$%I0' 9/@.*!) -%!]%; ,!B9**(!./B' -D%6!

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"%\$(0/%\$%R0!%\$H8%"/,./9%6X!

B' -!, \$%!(%) -!%/6%6!<"!U9*(!8K"K!

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J/!./%!Q., \$!%M; %@,) ,.' /2!6%; -%@.) ,.' /!-' 2%B-' D!n<^I <K^KKK!./!8KKI!, ' !nE^88G^KKK!./!8K"K!)/!./@-%)2%! ' B!Hm!W8KKI3!./@-%)2%! ' B!
"I mXid!!7!/9D?%-!' B!@); .,)!; -' q%@,2!Q%-!'@' D; %, %6!69-./1!, \$%!(%) -!)/6!6%; -%@.) , %6^!D' 2,!/' ,)?*(!, \$%-%' @) ,.' /!' B!, \$%!0' **%1%:2!
Lk9./%IV' 2; .,)*!) ,!, \$%!V)Q]2\$%)6!0)D; 92!)/6!, \$%!@' /5%-2.' /!' B!)!0.1\$, Q%**!) ,!, \$%!0)D6%/!0)D; 92!./, ' !)!2' @.)^!*%)-./!1j' /%d!

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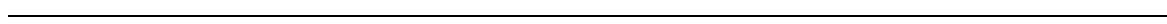
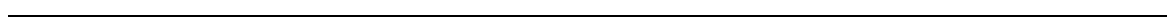
"K!

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"%\$(0/%\$%R0!%\$H8%"/,./9%6X!
B' -!, \$%!(%) -!%/6%6!<"!!U9*(!8K"K!

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C9DD)-(!' B!P./)/@.)"!>%-B' -D)/@%!8KKF=8K"K!



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"%\$(0/%\$%R0!%\$H8%"/,./9%6X!

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B' -!, \$%!(%) -!%/6%6!<"!U9*(!8K"K!
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"%\$(0/%\$%R0!%\$H8%"/,./9%6X!
B' -!, \$%!(%) -!/6%6!<"!U9*(!8K"K!

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-G8BAJ@FG8

#\$%B./)/@.)!-%29',!B' -!, \$%!(%) -!, ' !<"!U9*(!8K"K!Q)2!6.2); ; ' ./,./1d!!#\$%!6%B@.,!-%; ' -,%6!./@*96%6!)!/9D?%-!' B!' /%=' BB'!/ ' /=-%@9--%/ ,!

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H/6)+-!6\$, \$7+"!0"("\$5\$, " !
B' -!, \$%!(%) -!%/6%6!<"!U9^(!8K"K!
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#\$%!O' **%1%!2!)/!%M%D; !@\$. (19/6%-!

!

H/6)+-!6\$, \$7+"!0"("\$5\$, " !W@' /, ./9%6X!
B' -!, \$%(%) -!%/6%6!<"!U9*(!8K"K!

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\$8TF?G8=:8<EA@'F8E>FAF<C

#\$%!O' **%1%-!%@' 1/.2%2!.2!@' DD.,D%/!, ' !,\$%!6%.5%-(!' B!@)-?' /!-%69@,.' /!,)-1%,2!)/6!2!)@.5%*(!%/1)1%6!./!-%69@./1!.,2!
%/5.-' /D%/,) *!D:)@,dl!#\$2!.2!%5.6%/@%6!?(!, \$%#B)@,!, \$) !/,%Q!@; .,)*!6%5%' ; D%/ ,2!\$)5%!, ' !)\$\$.5%!A&LL7T !M@%**%/@%!2,)/6)-62!
./!, \$%.-!6%2.1/d!

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L/%-1(!92)1%!/6!Q)2,%!D),%-)*!; -' 69@,.' /!) ,!, \$%!O' **%1%.2!?(!, \$%!/), 9-%!' B!.,2!' ; %-),.' /2!\$.1\$!@' D;)-%6!, ' !2%@,' -!D%6.)/2d!
#\$%!O' **%1%.2!Q' -]./1!\$)-6!, ' !-%69@%!/-%-1(!@' /29D; ,.' /!, \$-' 91\$!, \$%!92!' B!; \$' , ' 5' *,)@!%**2!' /!, \$%!' ' B2! B!/%Q!2,96%/ ,!
-%2.6%/@%2!@9--%/ ,*(!9/6%-!@' /2,-9@,.' /d!

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#\$%!5)-.' 92!2,%; 2!?.%/1!)]%/!?(!, \$%!O' **%1%!, ' !D; -' 5%!. ,2!%/5.-' /D%/ ,)*!292,.) /)?*., (!Q%-!-%@%/ ,*(!-%@' 1/.2%6!./!, \$%!) ,%2,!
; 9?*.@) ,.' /!' B!, \$%!F/.5%-2, (!!4-%%/!0%)19%!

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;%\$0H&,0+6+)+"+\$0!&7!"#\$!-&))\$. \$!-&/,-+!
B' -!, \$\$(%)!-%/6%6!<"!U9*(!8K"K!

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#\$%! 0' 9/@.'! .2! -%k9.-%6! , ' ! ; -%2%/ ,!)96.,%6! B./)/@.)'! 2,) ,%D%/ ,2! B' -! %)@\$! B./)/@.)'! (%) -d! #\$\$\$! 0' 9/@.'! .2! -%2; ' /2.?%! B' -! , \$%! D). / , % /) / @ !) / 6 ! . / , % 1 - , (! ' B ! , \$ % ! 0 ' * * % 1 % : 2 ! @ ' - ; ' -) , % !) / 6 ! B . /) / @ .) ' ! . / B ' - D) , , ' / ! . / @ ' 9 6 % 6 ! ' / ! , \$ % ! 0 ' * * % 1 % : 2 ! Q % ? 2 . , % d ! 0 % 1 . 2 ') , , ' / ! . / ! , \$ % ! f / . , % 6 ! _ . / 1 6 ' D ! 1 ' 5 % - / . / 1 ! , \$ % ! ; - % ;) - , , ' / !) / 6 ! 6 . 2 2 % D . /) , , ' / ! ' B ! B . /) / @ .) ' ! . / B ' - D) , , ' / ! 6 . B B % - 2 ! B - ' D ! % 1 . 2 ') , , ' / ! . / ! ' , \$ % - ! q 9 - . 2 6 . @ , , ' / 2 ! d ! ! !

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-&%H&%("\$!.&*\$%,(,-\$!
B' -!, \$%(%) -!%/6%6!<"!U9'(18K"K!
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"d #\$\$! 0' **%1%! .2!@' DD.,%6! , ' !%M\$.?.,./1! ?%2,! ; -)@, @%! ./!)**!)2; %@,2! ' B!@' -; ' -),%! 1' 5%-/) /@%dl #\$.2! 29DD)-(! 6%2@-.?%2! , \$%!

"H!

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-&%H&%("\$!.&*\$%,(-\$!W@' /,.. /9%6X!

B' -!, \$%!(%) -!%/6%6!<"!U9*(!8K"K!

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"8d #\$\$!>-. /@.;)*) /6!, \$%!0' **%1%f2!2% /.' -!D) /) 1%-2! -%@%.5%! -%; ' - ,2!2%, ,.. /1! ' 9,!]%(!-.2]! ./6.@), ' -2!) /6!@' /2.6%-! ; ' 22.?%!@' /,- ' !
.229%2d!#\$%!&.2]!&%1.2,%-!

+ ,4\$H\$,4\$,!"(/4+"&%0 NP%\$H&%"
, ' !, \$%!T%D?%-2! B!O' 9/@.'! B!,\$!&' ()!+%,%-.)/-(!O' **%1%!
B' -!, \$%!(%) -!%/6%6!<"!U9*(!8K"K!
!

b%! \$)5%!)96.,%6! , \$%! B./)/@.)! 2,) ,%D%/ ,2! ' B! &' ()! +%,%-.)/-(!O' **%1%!
B' -!, \$%!(%) -!%/6%6!<"!U9*(!8K"K! Q\$.@\$.@' D; - 2%! , \$%!
@' /2' *6) ,%6!)/6!O' **%1%!./@' D%!)/6!%M; %/6.,9-%!)@' 9/,!, \$%!2,) ,%D%/ ,2! ' B! , ')! -%
1/.2%6!1) . /2!)/6!'' 22%2!, \$%!@' /2' *6) ,%6!
) /6!O' **%1%!?))/@!2\$% ,2!, \$%!@' /2' *6) ,%6!)/6!O' **%1%!@)2\$!B' Q!2,) ,%D%/ ,2!, \$%!2,) ,%D%/ ,!
! B! ; -./@.;)!)@' 9/,./1! ; ' *.@.%2!)/6!
, \$%!-%) ,%6!/' ,%2!'' , !<"!#\$\$%2%B./)/@.)!2,) ,%D%/ ,2!\$)5%!?%/%! ; -%;)-%6!9/6%!
-!, \$%!)@' 9/,./1! ; ' *.@.%2!2%, !' 9!, \$%-%./d!!!

! #\$.2!-%; ' -,!2!D)6!2' *%(!, ' !, \$%!O' 9/@.'! B!,\$!O' **%1%!2!)!?' 6(!./!)@' -6)/@!
Q., \$!, \$%!P./)/@.)!T%D' -)/69D!6) ,%6!U9!8KKHd!
a9-!)96.,!Q' -]!\$)2!?'%%/19/6%-.)]%/!2' !, \$!)Q%!D.1\$,!2,) ,%!, ' !O' 9/@.' :2!D%D?
%-2!, \$' 2%D) , ,%-2!Q%!)-%1-%k9-%6!, !2,) ,%!, ' !, \$%D!./!
) /!)96.,' -2!-%; ' -,!) /6!B' -!/' !, \$%-! ; 9-; ' 2@d!# ' !, \$%!B9**2,1%M, %/!, !-D., ,%6!
!?' Q!Q%!6' !/' !, !)@%; !' -!)229D%!-%2; ' /2?., (!, ' !) /(' /%!
! , \$%-!, \$) /!, \$%!O' 9/@.'!) /6!, \$%!O' 9/@.' :2!D%D?%-2!)!?' 6(!B' -!
! 9-!)96.,!Q' -]!B' -!, \$\$.2!-%; ' -,! -!B' -!, \$%! ; ./ /2!Q%!\$)5%!
B' -D%6d!

! %:@; :B<FT;!?: @; G8@F>FAF<F: @!GI!-GJ8BFA!E89!EJ9F<G?@

! # \$%!O' 9/@.' :2!-%2; ' /2?.,%2!B' -!, \$%! ; -%;)-. /! , \$%!7//9)*!&%; ' -,!) /6!, \$%!B./)/@.)!2,) ,%D%/ ,2! . /!)@' -6)/@!
Q., \$!, \$%!O' **%1%:2! ,2,) ,9,%!, \$%!C,) ,%D%/ ,! ' B!&%@' DD%/6%6!>-)@.,@%! ' /!7@' 9/,./1!B' -!P9-, \$%-!)/6!
V.1\$%-!L69@) , ' /!) /6! ' , \$%-! ; ; *.)?)*Q!)/6! f/.,%6!_ /16' D!)@' 9/,./1!2,) /6)-62!Wf /.,%6!_ /16' D!
4%/%-)**(17@%; ,%6!7@' 9/,./1!>-)@.,@%!) -!2%, !' 9!, !./!, \$%!2,) ,%D%/ ,! ' B! , \$%!
O' 9/@.' :2!-%2; ' /2?.,%2d!!

! a9-! -%2; ' /2?.,(! 2! , ' !)96.,! , \$%! B./)/@.)! 2,) ,%D%/ ,2! . /!)@' -6)/@!
Q., \$! -%5)/, ! *%1!) /6! -%19) , ' -(! -%k9-%D%/ ,2!) /6!
J/, %-/), , ' /)C,) /6)-62! /!796.,./1!Wf_)/6!J-%) /6Xd!!!

! b%! -%; ' -,!, ' !(' 9! 9-! ; ./ /!)2!, !Q\$, \$%-!, \$%!B./)/@.)!2,) ,%D%/ ,2!1.5%! , -9%!
/6!B) .-!5.%Q!)/6!\$)5%!?%/%! ; -' ; %-(! ; -%;)-%6!./!)@' -6)/@!
Q., \$!, \$%!C,) ,%D%/ ,! ' B!&%@' DD%/6%6!>-)@.,@%! /!7@' 9/,./1!B' -!P9-, \$%-!)/6!
V.1\$%-!L69@) , ' /d!b%!)*2' !-%; ' -,!Q\$, \$%-! ./@' D%!B- D!B9/6./1!?' 6.%2!1-)/2!)/6!
./@' D%B' -!2; %@B@; 9-; ' 2%2!)/6!B- D! , \$%-!-%2, -@,%6!B9/62!)6D./2, %-%6!
!?' (, \$%!O' **%1%

+, -&5\$!(,4!\$ZH\$,4+ "%\$!(--&/,"0 !
B' -!, \$%(%) -!%/6%6!<"!U9*(!8K"K!

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! ! ':E?!:89:9! [3!\JAC!1232 ! ! o%) -!%/6%6!<"!U9*(!8KKI!

!	!	-G8@GAF9E.	-GAA:S:	!	0' /2' *.6), %6!	0' **%1!
	S', %!]222!]222!		nKKK!	nKKK!
				!		
+, -&5\$!	!	!	!	!	!	!
!	!	!	!	!	!	!
P9/6./1!?' 6(!1-)/,2!	"!	1WU^!_	1WU^2_	8I ^E8K!	8I ^<I K!	
#9.,.' /!B%%2!)/6!%69@),.' /!@' /,-)@,2!	8!	`U1_a	`U13W	F^RGK!	F^RGK!	
&%2%)-@ \$!1-)/,2!)/6!@' /,-)@,2!	<!	`U`12	`U`12	I^I I H!	I^I I H!	
0^./@)*!)/6!-%*),%6!%)-./12!	E!	3bUa2a	3[U[2^!	"<^8E1!	"8^8HF!	
a,\$%-.!/@' D%!	E!	bU22a	[U3`!	<^KH!	8^H" H!	
L/6' QD%/,!)/6!./5%2,D%/,!./@' D%!	R!	b2^!	b2_!	8I F!	8H"!	
!		!	!			

0("\$5\$, " O!&7!"&"!)!%\$-&.,+0\$4!.(+,0!(,4!)&00\$0 !
B' -!, \$%!(%)!%/6%6!<"!U9*(!8K"K!
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! ! !:E?!:89:9![3!\JAC!1232 ! ! 0%)-!%/6%6!<"!U9*(!8KKI!
! ! -G8@GAF9E. -GAA:S: ! 0' /2' *.6),%6! 0' **%1!
S',%!]222!]222! nKKK! nKKK!

K4:IFBF002;AJ@!G8!BG8<F8JF8S!G::?E<FG8@!E ! K3U`3! K3U`2a ! HRG! HI <!
9:;?:BFE<FG8!G!IE @ @:<@!E<!TEAJE<FG8!E89!9f
E @ @:<@!E89!<EV
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J/@-%)2%cW\%@-%)2%X

6()(-\$!0#\$\$"0 !
)2!),!<"!U9*(!8K"K!
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! :E?!:89:9![3!\JAC!1232 ! 0%)-!%/6%6!<"!U9*(!8KKI!
! -G8@GAF9E- -GAA:S: ! 0' /2' *.6),%6! 0' **%1!
S',%!]222!]222! nKKK! nKKK!
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7+Z\$4!(00\$"0
#) /!2*%!)22%,2!
J/5%2,D%/ ,2!
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John Shepard

Charles Perrin

Charles Perrin

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O("5\$,!"&7!H%+,-+H()!(--&/,"+,.!H&)+--+5\$!
B' -, \$!(%)!-%/6%6!<"!U9*(18K"K!

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3f16(0+0!&7!H%\$H("%+&,
#\$%2!B./)/@."12,)%D%/2!\$5!%?%!/!;-%;)-%6!./!@-6)/@!Q,.\$!,%C,)%D%/!'B!&@'DD%/6%6!>-)@.#!WCa&>X3!7@'9/./1B' -!
P9-,\$%-!)/6!V.1\$%-!L69@),./!8KKG!)/6!./!@-6)/@!Q,.\$!);;*.@)?%!@'9/./12,)/6)-62d!#%\$!B./)/@."12,)%D%/2!)-%!;-%;)-%6!
./!@-6)/@!Q,.\$!\$.2,.'-@)!@'2!@'5%/./!/'D'6.B.%6!?(,,\$!-%5)*9),./!'B!@%-),./!B.M%6!)22%,2d!

!

.GF8S!BG8B!78

#\$%!O' **%1%2!)@.5..%2!, '1%, \$%-!Q,.\$!, \$%!B)@.'-2!*]%(!'!)BB@!..2!B9,9-%!6%5%** ; D%/,'!;-B' -D)/@!)/6!; '2.,./!)-%12%,!'9!./!,\$%!
#-%)29-%-2!&%; '-,!' /!;)1%2!<!, '!'<d!#%\$!B./)/@."1; '2.,./!'B!,\$%!O' **%1%!,2!@2\$!B' Q2!*k9.6.,(!;'2.,./!)/6!?'--'Q./1!B)@.'.,%2!
)-!)2'!6%2@-?%6!./!,\$%!#-%)29-%-2!&%; '-,d!#%\$!O' **%1%!)2!@' /2.6%-)?%\$!B./)/@."1-%2'9-@%2d!72!)!@' /2%k9%/@%!, \$%!O' **%1%!
O'9/@.'!?'*%5%!, \$),!,\$%!O' **%1%!2!Q%!*!;*)%6!, '!'D)/1!.,2!?'92./%22!-2]2!29@%22B9**(!6%2; .,,\$%!@9-@%/,!9/@%-),./!D.@!
'9,*']d!#%\$!O'9/@.'!\$5%!)!-%2' /)?%\$!M; %@,./!,\$),!,\$%!O' **%1%!)2!)6%k9,)!-%2'9-@%2!,!@' /./9%!.!/' ; %-,./)!%M.2%/@%!
B' -!, \$%!B' -%2%?)?%!B9,9-%d!#%92!, \$%(!@' /./9%!, '!6' ; ,!,\$%!1' .!/@' /@%-!/?)2.2! B!)@'9/./!./!.-%;)-./!,\$%!) /9)!B./)/@."!
2,)%D%/2d!!

!

1f16(0+0!&7!-&,0&)+4("+&, !!

#\$%\$!B./)/@."12,)%D%/2!@' /2'*.6),%!, \$%-!29',2!'B!,\$%!O' **%1%!) /6!,\$%!7/.D)*!O)-!#-92,!)!2%;)-),%1-2,%-6!@)\$-.,(?!#\$%!O' /6' /!
A'2@.%/@!J//5),./! /!O%/,-%!O.D.,%6'! &+O! \%'5%** ; D%/2!O.D.,%6!)/6!&'()!+%,%-./)-(O' **%1%!WV' /!_ /!1!O.D.,%6d!#%\$!
29?2.6.)-%2!\$5%!, \$!)2!D%!(%)!-%/6!)2!,\$%!O' **%1%!#%\$!@' /2'*.6),%6!B./)/@."12,)%D%/2!6'! /!./@'96%!, \$'2! B!,\$%!C,96%/!F./' /!
C'@.,(!?'@)92%!, \$%!O' **%1%!6' %2! /! ,!@' /,-'!,\$'2!@',.5.,%2! /-!6'!, \$%(./@'96%!, \$'2! B!T %60%**A'2@.%/@'2!O.D.,%6!)2!,\$%!-%29',2!
'B!,\$%!@'D;) /(!)-!@' /2.6%-6!D.D),%-)d!!

!

[!%\$-&.,+"&.!&7!+,-&5\$! !

P9/6./1!@'9/@.'!?' @]1-)/2!)-%!@'9/,%6!B' -!./!,\$%!,%-. '6!,!Q\$.@\$!, \$%(!-%),%d!!

!

P%\$!./@'D%!2!2,)%6!1-22!)/6!@-%6,%6!, '!, \$%!./@'D%!)/6!%M; %/6.,9-%!)@'9/,'!5%-!, \$%!,%-. '6!,!Q\$.@\$!2,96%/2!)-%2,96(. /1d!
A9-2)-%2!)/6!2@\$'*)-2\$; 2!)-%!@'9/,%6!B' -!1-22!)2!%M; %/6.,9-%!)/6! /!6%69@,%6!B' D!./@'D%!!

!

&%@9--%/!./@'D%!B' D!1-)/2!@' /,-)@2!)/6!,\$%!-!2%-5@%2!-%/6%-%6!)-%!@'9/,%6!B' -! /! /!)@-9)*2?)2.2!)/6!./@'96%!, '!, \$%!
%M, %/6.,9-%! /! B!,\$%!@'D; *%,' /! B!,\$%!@' /,-)@,!' -!2%-5@%!@' /@%- /%6h!) /(!;) (D%/2!-%@%.5%6! ./!)65)/@! 'B!29@!\$! ; %B' -D)/@!)-!
-%@'1/.2%6' /!,\$%!)?)*)/@!2\$%\$,!)2!*).?*,%2d!!

!

\' /),./ /2!Q,.\$!-%2,-@.' /2!)-!-%@'1/.2%6!Q\$%/!-%*5)/!@' /6.,./ /2!\$5!%?%!/D%h!./!D)/(!@2%2!-%@'1/.,./!2!6.-%@,'(1-%),%6!, '!
%M; %/6.,9-%! /@9--%6! /!2; %@.B.@; 9-; '2%2d!\' /),./ /2!Q\$.@\$!)-%!, '!'?%!-%,)./%6!B' -!, \$%!7%/B.B.! B!,\$%! /2,,9,./!)-!-%@'1/.2%6!./!
,\$%!2,)%D%/!' B!, ')!-%@'1/.2%6!1)/2!)/6!22%2!)/6!./! /6' QD%/2h!, \$%-!6' /),./ /2!)-!-%@'1/.2%6!?(./@'92' /!)2!, \$%-!./@'D%!
./!,\$%!./@'D%!) /6!%M; %/6.,9-%!)@'9/ ,d!!

!

S' /-=%@9-@/ ,!1-)/2!)-%@%.5%6!./!-%2; %@,!' B!,\$%!)@k9.2.,./! /! -!@' /2,-9@,./! /! B!B.M%6!)22%,2!)-%!,-%),%6!)2!6%B%--%6!@); .,)!1-)/2d!
C9@\$!1-)/2!)-%!@-%6,%6!, '!6%B%--%6!@); .,)!1-)/2!)/6! /!) /9)!,-/2B%-!D)6%!, '!, \$%!./@'D%!) /6!%M; %/6.,9-%!)@'9/,'!5%-!, \$%!
92%B9!%@' /' D.@!B%! B!,\$%!)22%,!)!,\$%!)2!D%!)2!, \$%!16%; -%@,./! /!@' -!%! /!,\$%!)22%,!B' -!Q\$.@\$!, \$%!1-)/,!Q)2!Q)-6%6d!!

!

J/@'D%!B' D!,\$%!2)*%! B!1' '62! -!2%-5@%2!2!@-%6,%6!, '!, \$%!./@'D%!) /6!%M; %/6.,9-%!)@'9/,'!Q\$%/!,\$%!1' '62! -!2%-5@%2!)-%!
29; ; *%6!, '!, \$%!%M, %-)!@92, 'D%-2! -!, \$%!,%D2! B!,\$%!@' /,-)@,!)5!%?% /!2),-2B.%6d!!

!

L/6' QD%/!) /6! /5%2,D%/!./@'D%!2!@-%6,%6!, '!, \$%!./@'D%!) /6!%M; %/6.,9-%!)@'9/,'! /!)!-%@%.5)*%?!?)2.2d!J/@'D%!B' D!
-%2,-@,%6! /6' QD%/2! /! ,!%M; %/6%6!./!)@' -6)/@!Q,.\$!, \$%!, \$%-!2,-@,./2! B!,\$%! /6' QD%/,'!2!,-/2B%--%6!B' D!,\$%!) /@'D%!) /6!
%M; %/6.,9-%!)@'9/ ,! ,!-%2,-@,%6!%

O("\$5\$,!"&7!H%+,--+H)!(--&/,"+,.!H&)+--+ \$O !W@' / ,./9%6X!
B' -!, \$%! (%)-!%/6%6!<"!U9*(!8K"K!
!

_f!)(,4!(,4!6+/)4+,.0! !
0)/6!)/6! ?9.*6./12!)-%!2,) ,%6!)!\$.2, ' -@)!*!@' 2,d! 0' 2,2! ./@9--%6! ./!-%*) , ' /! , ' !) ,)/1.?%! B.M%6!)22%,!)B,%-!.,2!./.,.)! ; 9-@)\$)2%! ' -!
; -' 69@,.' /!) -%!@) ; ..)*.2%6! , ' !, \$%!%M, %/ ,! , \$) ,! , \$%(!./@-%)2%! , \$%!%M: %@ %6!B9, 9-%!/?%/B.,2! , ' !, \$%!./2,.,9,.' /!B-' D! , \$%!%M.2,./!!) /1.?%!
B.M%6!)22%,!/?%(' /6! ,2! ; -%5.' 92*(!)22%22%6!2,)/6)-6!' B! ; %B' -D)/@%h! , \$%!@' 2,! ' B!)/(!29@\$!%/ \$)/@%D%/ ,2!)-%!)66%6! , ' !, \$%!1-' 22!
@)--(/!!)D' 9/ ,! ' B! , \$%! ,)/1.?%!B.M%6!)22%,!@' /@%-/%6d!!
!

_KEO!4:;?:BFE<FG8!
P-%%\$' *6!)/6!.2!/' ,!6%; -%@.) , %6d!A9.*6./12!)-%!6%; -%@.) , %6!' 5%-! , \$%.-!%M; %@ , %6!92%B9!*%@' /' D.@!* .5%2! , ' !, \$%!0' **%1%! ' B! ?% , Q% %/!8K!
)/6!8R!(%) -2! /! , \$%!) D' 9/ , !) , ! Q\$.@ \$! , \$%! ,)/1.?%!B.M%6!)22%,!2!./@'96%6!./! , \$%!?)*) /@%!2\$% , d!S' !6%; -%@.) , ' /!2!@ \$) -1%6!' /!)22%,2!
./! , \$%!@' 9-2%! B!@' /2, -9@,.' /d!!

_K>O!%:;EF? @!E89!=EF8<BE8B:!
LM; %/6., 9-%! , ' !%/29-%! , \$) , !) ,)/1.?%!B.M%6!)22%,!D)./ ,) ./2!.,2! ; -%5.' 92*(!-%@' 1/.2%6!2,)/6)-6!' B! ; %B' -D)/@%!.2!-%@' 1/.2%6!./! , \$%!
./@' D%!) /6!%M; %/6., 9-%!)@' 9/ , ! /! , \$%! ; %-.' 6! , .2!./@9--%6d!#\$%!0' **%1%!\$)2!)!; *) /%6!D)./ , %/)/@%! ; - 1-)DD%Q\$.@ \$! .2!-%5.%Q%6!
' /!)/!)/9)*?)2.2d!!
!

_KBO!#: ?F<ES:!(@ @ :< @ @ !
b' -]2!' B!)-,!) /6!' , \$%-!5)*9)?*!)-, %B)@, 2!W\$%-.,)1%)22%,2X!)/6!5)*9%6!) , !' 5%-!nR*KK!\$)5%!/?%/!@) ; ..)*.2%6!)/6!-%@' 1/.2%6!?)2%6!
' /!5)*9) , ' /2!@)--%6!' 9, ! ?(12; %@.)*.2, !5)*9%-2d!V%-.,)1%)22%,2!)-%! / , !6%; -%@.) , %6!2./@%! , \$%.-!' /1!%@' /' D.@!*B%!) /6!\$.1\$!-%2.69)!
5)*9%! D%)/!)/(!6%; -%@.) , ' /! Q' 9*6! /' , ! ?%! D) , %-.) *d! # \$%! \$.2, ' -@! * .?-) -(!@' **%@,.' /! Q)2!5)*9%6!./6%; %/6%/ , *(' /!8KKH! ?(! T -!

0("(\$5\$,!"&7!H%+,-+H!)(- -&/,"+,-!H&)+--+ \$0 !W@' / ,./9%6X!
B' -!, \$!(%)!-%/6%6!<"!U9"(!8K"K!
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3f!(--&/,"+,-!7&%!-#(%+"(6)\$!4&,"+&,0!
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3[KEQ/8?: @<?FB<:9!9G8E<FG8@!!
0\$)-,)??%!6' /),./ /2!)!-%@' 1/.2%6!./!, \$!)@' 9/ ,2!Q\$%/!, \$!)@' -,)??%!6' /),./ /!\$)2!??%/!-%@.5%6!' -!B!?'%B' -!-%@%; ,!, \$!-%!2!
29BB.@%/ ,!%5.6%/@%!, ' !; ' 5.6%!, \$!/%@%22)-(!@%-),./ ,(!, \$)!, \$!)6' /),./ /!Q.**!?!-!-%@.5%6!)/6!, \$!)5)*9!' B!, \$!)!./@' D./1!-%2' 9-@%2!
@)!/?%!D%)29-%6!Q., \$!29BB.@%/ ,!-%*)?., (d!!
!

3[K>O!\$89GL=:8<!J89!@!
b \$%-!@%)?%!6' /),./ /2!)!-%!?'%!-%),./%6B' -!, \$!)?%/B.,! B!, \$!)!./2,,9,./ /!)2!2; %@.B.%6!?(!, \$!)6' /' -2!, \$!)2%)!-%!)@' 9/ ,%6B' -!
)2!%/6' QD%/ ,2!#%\$-!)!-%!, \$!-%!D)./!, (; %23!!
!

"d f/-%2,-@,%6!;%-D)/%/,!%/6' QD%/ ,2!Y!, \$!)6' /' -!\$)2!2; %@.B.%6!(\$),!, \$!)B9/6!2!, ' !?%; %-D)/%/,*(!./5%2,%6!, ' !1%/-%),%)!/
./@' D%!2,-%)D!B' -!, \$!)?%/B.,! B!, \$!)!./2,,9,./ /d!!

8d &%2,-@,%6!M;%/6)??%!%/6' QD%/ ,2!Y!, \$!)6' /' -!\$)2!2; %@.B.%6!(!); -,@9*)-!?'%@,5%!, \$!-%!, \$!)!./2,-9@,./ /! B!
,./1.?'%B.M%6!)22%,2!)/6!, \$!)!./2,,9,./ /!@)!@' /5%-!, \$!)6' /),%6!29D!./ ,!./@' D%!!

<d &%2,-@,%6!;%-D)/%/,!%/6' QD%/ ,2!Y!, \$!)6' /' -!\$)2!2; %@.B.%6!(\$),!, \$!)B9/6!2!, ' !?%; %-D)/%/,*(!./5%2,%6!, ' !1%/-%),%)!/
./@' D%!2,-%)D!,' !?%;); ; *%6!, ' !); -,@9*)-!?'%@,5%!!

3[KBD4G8E<FG8@!IG?!!FV:9!E @ @ :<@!
\\ /),./ /2!-%@.5%6!, ' !?%;); ; *%6!, ' !, \$!)@' 2,1' B!)! ,./1.?'%B.M%6!)22%,!)!-%2\$' Q!/' /!, \$!)?)@' /@%!2\$%,!)2!)!6%8%--%6!@; ..)'11-)/,d!
#\$%!6%B%--%6!@; ..)'11-)/,!2!-%%)2%6!, ' !, \$!)!./@' D!)!)/6!M; %/6,,9-!)@' 9/ ,! 5%-!, \$!)2)D%!2,D),%6!92%B9!*B%!, \$)!,!2!92%6!, ' !
6%,%-D./%!, \$!)6%; -%@),./ /!@%)22' @),%6!Q., \$!), \$!)!./1.?'%B.M%6!)22%,d!!
!

3bf!(--&/,"+,-!7&%!%\$"+%\$5\$,!"6\$, \$7+"0 ! !
#\$%!0' **%1!@' /,-?9,%2!, ' !, \$!)f/.5%-2,,%2!C9; %-)/9),./ /!C@\$%D!W!FCCX!)/6!, \$!)C9; %-)/9),./ /17--)/1%D%/ ,2!B' -!, \$!)f/.5%-2, (1
' B!0' /6' /!WC7F0X!A' ,!2!@%\$D%2!)!-%!6B./%6!7%/B.,!2!@%\$D%2!)/6!?' , \$!)!-%!D9', =D; ** (%-!2!@%\$D%2!)/6!,!2!/' ,!; ' 22.?'%!, ' !6%/ ,B(!
, \$!)!22%,2! B!, \$!)2!2!@%\$D%2!Q\$.@\$!)!-%!),.-?9,.)??%!, ' !, \$!)0' **%1!d!J!/@' -6)/@%!Q. \$!P&C!''G!, \$%)2!2!@%\$D%2!)!-%!)@' 9/ ,%6B' -!'/!)!
6%B./%6!@' /,-?9,./ /!?)2.2!)/6!@' /,-?9,./ /2!, ' !, \$%)2!2!@%\$D%2!)!-%!./@'96%6!)2!M; %/6,,9-!)!/, \$!)!; %-. ' 6!./!Q\$.@\$!, \$!)!-%!); ()?'%d!!
!

3_fH%&*+0+&,0!(,4!-&,"+,-!\$,"!)+(6+)++\$0! !
>-' 5.2.' /2!)!-%!@' 1/.2%6!./!, \$!)B./)/@.*!2,)%D%/ ,2!Q\$%/!, \$!)0' **%1!\$)2!)!; -%2%/ ,!?'*.1),./ /!W%1)'!-!@' /2,-9@,5%!(2!)!-%29',! B!)!
;)2!,%5%/ ,!,!2!; -?'?'%!, \$)!,!,-)/2B%-!' B!@' /' D.@!7%/B.,2!Q.**!7%-!%k9-%6!, ' !2%, ,%!, \$!)?'*.1),./ /!)/6!)!-%*)??%!2,.)D),%!@)!/?%!
D)6%!' B!, \$!)!D' 9/ ,! B!, \$!)?'*.1),./ /d!!
!

0' / ,./1%/ ,!*)?.,%2!)!-%!6.2@* 2%6!?(!Q)(! B!/' ,%!Q\$%/!, \$!)6%B./ ,./ /! B!)!; -' 5.2.' /!2!/' ,!D%,!)/6!./@'96%2!,\$-%!2!@%/)-.' 23!
; ' 22.?'%!(%), \$!-%!, \$!)!); -%2%/ ,!?'*.1),./ /h!)!; ' 22.?'%!(%), \$!-%!, \$!)!); -?'?'%!' 9,B' Q!' B!@' /' D.@!7%/B.,2h!)/!./?)?., (!, ' !D%)29-%!
, \$!)!@' /' D.@! 9,B' Qd!!
!

3^f!H\$,0+&,0 !!
#\$%!./2,,9,./ /!); -,@;),%2!./!, \$!)f/.5%-2,,%2!C9; %-)/9),./ /!C@\$%D!W!FCCX!)!6B./%6!7%/B.,!2!@%\$D%2!Q\$.@\$!)2!@' /,-)@,%6!' 9!,! B!
, \$!)C,)%!C%@' /6!>%/2.' /!WC8>X!#%\$!)22%,2! B!, \$!)2!2!@%\$D%2!)!-%!\$*6!./!)!2%; -),%!, -92,%%=)6D./2,%-%6B9/6d!A%@)92%!' B!, \$!)!
D9,9)!' /),9-!' B!, \$!)2!2!@%\$D%2!,\$!2!2!@%\$D%2!)22%,2!)!-%!/' ,!\$ (; , \$%)@,%6!, ' !./6.5.69)'!./2,,9,./ /2!)/6!)!2!@%\$D%2!Q.6%!@' /,-?9,./ /!
)!.,!2!2%,d!#%\$!./2,,9,./ /!2!, \$!-%@B' -!%M; ' 2%6!, ' !@,9,-)'!-2!2!)22' @),%6!Q., \$!), \$!-%!./2,,9,./ /2!%D; ** (%%2!)/6!2!9/)??%!, ' !

!

,&"\$0!"&!"#\$!(--&/"0 !
B' -!, \$%!(%)!-%/6%6!<"!U9*(!8K"K!

!

!

! :E?!:89:9![3!\JAC!1232

!

o%)-!%/6%6!<"!U9*(!8KKI!

!

!

!

!

,&"\$0!"&!"#\$!(--&/,"0 !KBG8<F8J!90
B' -!, \$%!(%)!-%/6%6!<"!U9*(!8K"K!

!

!

!E?!:89:9![3!\JAC!1232

!

o%)-!%/6%6!<"!U9*(!8KKI!

!

!

! -G8@GAF9E. !!!!!!!!!!!-GAA!E ! !!0' /2' *.6),%6! !!!!!!!!!O' **%1!
S',%! !!!!!!!!!!222! !!!!!!!!!!222! !!!!!!!!!nKKK! !!!!!!!!!nKKK!

!

^f 0"(77!-&0"0!

!&"\$0!"&!"#\$!(-&/,"0 !KBG8<F8J:9O
B' -!, \$%! (%)-!%/6%6!<"!U9*(!8K"K!

! ! 'E?!:89:9!3!JAC!1232 ! 0%) -!%/6%6!<"!U9*(!8KKI!

! ! -G8@GAF9E- -GAA:S: ! 0' /2' *.6), %6! 0' **%1%!
! !]222!]222! nKKK! nKKK!

`f (,'()0+0!&7!"&"!)!\$ZH\$,4+!/%\$!6!(-"+*+" ! ! ! !
7@)6%D.@!6%;)-, D%/ ,2! 3WU[! 3WU12 "G^RI ! ! "G^GI <!
7@)6%D.@!2%-5.@%2! ^U1Wz ^U1Wb F^8HG! F^8HG!
&%2%) -@\$1-)/ ,2!)/6!@' / , -)@,2! aUb^! aUb^! H^FKK! H^FKK!
&%2.6%/ @%2!)/6!@) , %-./1! 3U_`1 3U_`1 ""^<H8! ""^<H8!
>-%D.2%2!)/6!D). / , %/)/@! WU_!v WU_!v H^I KR! H^I KR!
76D./2,-), . ' /! bU11! bU11! <^GH! <^GH!
0'./ @)!)/6! , \$%-12%-5.@%2!Y!O' **%1%! 3^Ua3! 3^Ua3! "E^HG! "E^HG!
0'./ @)!)/6! , \$%-12%-5.@%2!Y!C9?2.6.) -.%2! 1U3b^ P ""FEF! =!

! ! ^aU^bb ^_Ub_! ! ! F^^GHE! FK^ERK!
a; %-) , ./1!%M; %/2%2!./@'96%3! ! ! ! !
LM, %-/)!)96., ' -2!-%D9/(-) , ./ !./!-%2; %@, ! B!)96., !2%-5.@%2! b[! [b! EH! E8!
LM, %-/)!)96., ' -2!-%D9/(-) , ./ !./!-%2; %@, ! B! /' / =)96., !2%-5.@%2! _! _! HR! HR!

! ! ! ! ! !
Wf &"#\$%!&H\$%("+, ! \$ZH\$,0\$D ! ! ! !
O), %-./1!; -' 5.2.' /2! b2a [^1! E^HI! EKG!
0' /29D)?%2!)/6!')?' -) , ' -(!%M; %/2%2! _U1_! _U3W; E^<G<! E^G^<!
C,) , ' /%-(!)/6!; 9?*.@) , ' /2! 3U1a3 3U1bW ""^<KF! ""^8GH!
C, 96%/ , !)/6!6!69@) , ' /)!)!%M; %/6., 9-%! [Uab! [Uab! <^K^K! <^K^K!
&%/ , !-) , %2!^@%) / ./1!)/6!./29-) / @%! 3U12! WWt ""^8H! HI K!
L^%@, -.@, (Y1)2!^' :!)/6!Q) , %-! 3Ua2b 3U_W; ""E^< <^<ER!
CD)**!%k9.; D%/ , !)/6!-%;) -2! 3la[W 3la1b ""^I^I! ""^HFR!
T./' -!Q' -]2!)/6!D). / , %/)/@! 3Cb2! 3Uq! ! ""FR<! ""FK^!
LM, %-/)!)96., ' -2!-%D9/(-) , ./ ' /! b[! [b! EH! E8!
J/, %-/)!)96., ! b! b! <H! <H!
0%1)!) /6! , \$%-! ' 9.2.6!@' /29^ ,)/@(! [U21! 1UWb| E^8H! E^88<!
#-)5%*. /1!29?2.2, %/@%! 1U3b1 1U2^! ""F^<G! ""F^8E!
#%*%; \$' /%YB)M!)/6!; ' 2,)1%! ^_! _W^ RGE! RK!
T.2@%**)/% 92!%M; %/2%2! 3U11b _b! I FG! GF!
O\$)/1%!./!; -' 5.2.' /! P P WGRKX! WGRKX!

! ! 1bU1a^ 11UWb; ! 88^KE<! 8""R8"!

!

,&"\$0!"&!"#\$!(--&/",0 !KBG8<F8J!90
B' -!, \$%!(%)!%/6%6!<"!U9^(!8K"K!

!
!

33f

!
,&"\$0!"&!"#\$!(--&/,"0 !KBG8<F8J!90
B' -!,,\$%!(%)!-%/6%6!<"!U9*(!8K"K!

!
!
!
!:E?!:89:9!3 !\JAC!1232 ! 0%)!-%/6%6!<"!U9*(!8KKI!
!
! -G8@GAF9E. -GAA:S: ! 0' /2' *.6),%6! 0' **%1%!
]222!]222! nKKK! nKKK!
!
!
!
!
31f \$,4&d5\$,!"!(00\$"+, *\$0"5\$, " !
V.2, ' -.@)'10' 2,!),!"!79192,!! !
T)-]%,!+)*9%!76g92,D%/,!),!"!79192,!
]22! WUWk "K^IGI! I^G"FI
1[b! IER! IER!
T)-]%,!+)*9%!),!"!79192,! ! 33U1`! 32U3`\$! ""^!8E! "K^FF"!
!
766.,./ /2! ! 1U122 1U122 !
\.2; ' 2)^2! P P
T)-]%,!+)*9%!76g92,D%/,! `^3! ` _2!
0)2\$!T' 5%D%/,! K3U1W' K1U3[!(!
!

!

,&"\$0!"&!"#\$!(--&/,"0 !KBG8<F8J!90
B' -!, \$%(%)!-%/6%6!<"!U9*(!8K"K!

!	'E?!:89:9![3!\JAC!123Z	!	o%)!-%/6%6!<"!U9*(!8KKI!	!	
!	-G8@GAF9E.	-GAA:S:	!	0' /2' ^6),%6!	0' **%1%!
]222!]222!		nKKK!	nKKK!
		!			
3_f!!!! %\$4+"&%0Q!(5&/,"0!7())+,!4/\$!d+"#+,!&,\$!\$(% !	!	!			
!	!	!			
f/2%9-%6!'')/2!	1W!	1W!			
#-)6%!@-%6.,' -2!	3UbW!	3W!			
7D' 9/,2! Q%6!, ' !29?2.6.)-(!9/6%-.)]./12!	P	1U^^!			
&%2%)-@\$!1-)/,2!@-%6.,' -2!	`U21^	`U21^			
C' @.)!C%9-., (!)/6! ', \$%-!,)M),,' /!;)()?'%!	3U1_!	3U^^!			
a,\$%-!@-%6.,' -2!	W!	W!			
7@@-9)^2!)/6!6%8%--%6!./@' D%!	`_a!	a^2			
!	!				
	!				

!

,&"\$0!"&!"#\$!(--&/,"0 !KBG8<F8J!90
B' -!, \$%!(%)!%/6%6!<"!U9^(!8K"K!

!
!

!

!

:E?!:89:9![3!\JAC!1232

!

!

,&"\$0!"&!"#\$!(- -&/,"0 !KBG8<F8J:9O

B' -!, \$%(%) -!%/6%6!<"!U9*(!8K"K!

3W!,\$,4&d5\$,"0!KBG8<F8J:9O

/8?:@<?FB<:

%:@<?FB<

"G<E/

%:@<?FB<

123Z

122W

H:?=E8:8<

H:?=E8:8<

H:?=E8:8<

\$V;:89E>A!

"G<E/

"G<E/

]222!

]222!

]222!

]222!

]222!

]222!

-GAA:S:

!

!

!

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!

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!

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6EAE8B:@!E@!E<!3!(JSJ@<!122W

!

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!

!

0);..)!

"^FKI!

<^KKI!

E^F^H!

"^FRF!

^U1ab

F^GE<!

7@@9D9'),%6!./@' D%!

"^<EK!

8^G8G!

E^KFG!

W^FKX!

[UW2e

<^! "H!

!

!

!

!

!

!

!

!

8^!EI!

R^G<F!

H^FHR!

"^EI F!

32U3`B

"K^FF"!

S%Q!%/6' QD%/ ,2!

ER!

8!

EG!

"HE!

1[3!

8E"!

!

J/5%2,D%/ ,!./@' D%!

I8!

"FH!

8FK!

R8!

[31!

"GG!

LM; %/6.,9-%!

WI 8X!

W3F8X!

W<REX!

W^8EX!

Kba`C

W^HHX!

!

!
,&"\$0!"&!"#\$!(--&/,"0 !KBG8<F8Jt:9O
IG?<D:!C:E?!:89:9!3!JAQ2B2!

!

!

!

!

!

!

,&"\$0!"&!"#\$!(--&/,"0 !KBG8<F8J!90

B' -!, \$%(%)!-%/6%6!<"!U9*(!8K"K!

!
!

!
!

! :E?!:89:9![3!\JAC!1232 ! o%)-!%/6%6!<"!U9*(!8KKI!

!

!

! -G8@GAE9E -GAA:S: ! 0' /2' ^.6),%6! 0' **%1%!
S',%!]222!]222! nKKK! nKKK!

11f %\$-&,-+)+("+&,&7!K4\$7+-+"Oc0/%H)/0!6\$7&%\$!"(Z!(,4!H%&7+"!&,!4+0H&0!)!&7!(00\$"0!"&!, \$"!-(0#!+,7)&d!7%&5!
&H\$%("+&,&

!

!
,&"\$0!"&!"#\$!(--&/,"0 !KBG8<F8J!9O
B' -!,\$(%!(%)!%/6%6!<"!U9*(!8K"K!

!
!
1W4+0-)&0/%\$!&7!%\$)("4!H(%!"%(,0(-"+&,0 !
!

!
#%\$!0' **%1%!\$)2!,)]%/!)65)/,) 1%! B!, \$%!%M%D; ,.' /!@' /B%--%6!?(!P./)/@.)!&%; ' -./!1!C,) /6)-6!S' dH!-%),%6!>)-,(!\2@' 29-%2:'!, ' !
6.2@' 2%!, -)/2)@,.' /2!Q., \$!-%*), %6!;)-, %2!Q\$. @\$!) -%!%.D./), %6! /!@' /2' *.6),.' /d!!7!-%*), %6!;)-, (!-%*), ,.' /2\$.; !%M.2,2!7%, Q%!/!, \$%\$!0' **%1%!
)/6!+.-%M.2d!!>' B%22' -!V' Q)-6!2!)!6.-%@, ' -! B!, \$%!29?2.6.)-(!0' /6' /!A.' C@.%/@%!!// 5),.' /!0%/,-%!0,6!)/6!)!@' /,-' **./1!2\$)-%\$' *6%-! B!
+.-%M.2d!!#%\$!0' **%1%!)*2' !)\$ 2!8<m!2\$)-%\$' *6./1!./!+.-%M.2d!!+.-%M.2!2!)!@92, ' D%-! B!, \$%!29?2.6.)-(!)/6!;) (2!B' -!)*?' -), ' -(!2%-5.@%2!)/6!
)@@' DD' 6),.' /!)!, \$%!2)D!-), %!)2! , \$%-!@92, ' D%-2d!!#%\$!)D' 9' /!69%!B- D!+.-%M.2!)!, \$%!(%)-!%/6!2!n/.*!W8KK! 3!n/.*Xd!
!

!
#%\$!0' **%1%!\$)2!)!8d! 8m!2\$)-%\$' *6./1!./!T %6@%**!A.' C@.%/@%2!0, 6d!!7, !, \$%!A)*)/@%!C\$%%, !6), %!T %6@%**! Q%6!, \$%\$!0' **%1%!nR8""Kd!!
C9?2%k9%/ ,*(, \$%\$!0' **%1%!\$)2!7%%/!/ , .B.%6!, \$), !, \$2!6%?, !.2!9/.*]%(!, ' !?%;) .6!)/6!, \$%!6%?, !)\$ 2!7%%/!B9**(!; -' 5.6%6!B' -d!
!

!
#%\$!0' **%1%!1-)/, %6!)!n<KK^KKK!./, %-%2, !B-%!*')/!, ' !, \$%!>-./@.;)*)2!;)-, !' B!\$.2!-%*' @),.' /!;)@]) 1%#%\$!*')/!2!2@9-%6! /!\$.2!; -' ; %-, (!
)/6!, \$%!7%/B, .!./!]/6!)-.2/1!B-' D!, \$%!*')/!2!n""H^KKK!W8KK! 3!n""H^KKK!d!!#%\$!?)*/@%!' B!, \$%!*')/!' 9,2,)/6./1!, !<"!U9*(!8K"K!Q)2!
n<KK^KKK!d!!#%\$!*')/!Q.**!7%!-%;) .6!./!, \$%!%5%/!, \$), !, \$%!; -' ; %-, (!2!2' *6!' -!)
!

!

,&"\$0!"&!"#\$!(--&/,"0 !KBG8<F8Jt:9O

B' -!, \$%(%)!-%/6%6!<"!U9*(!8K"K!

!

[3f !!!H\$,0+&,!0-#\$5\$0! KBG8<F8Jt:9O

!

A%e) 92%! ' B!, \$%!D9,9)*!/, 9-%! ' B!, \$%!2@%\$D%2^!, \$%! 22%, 2!) -%l/ ' ,!\$(; ' , \$%e) , %6!, ' !./6.5.69)*!./2,..9,.. /2!)/6!)!2@%\$D%=Q.6%!
@' / , - : ? 9 , . ' /! - , %! . 2! 2%, d# \$ % ! . / 2 , . , 9 , . ' /! . 2! , \$ % - % B ' - % ! % M ; ' 2 % 6 ! , ' !) @ , 9 - .) * ! - . 2] 2 !) 2 2 ' @ , , % 6 ! Q , \$, ' , \$ % - ! . / 2 , . , 9 , . ' / 2 : ! % D ; * ' (% % 2 !) / 6 ! . 2 ! 9 /) ? * % !
, ' ! . 6 % / , . B (! , 2 ! 2 \$) - % ! ' B ! , \$ % ! 9 / 6 % - * (. / 1 !) 2 2 % , 2 !) / 6 ! *) ? * . . % 2 ! ' B ! , \$ % ! 2 @ % \$ D % 2 ! ' / !) ! @ ' / 2 . 2 , % / , !) / 6 ! - %) 2 ' /) ? * % ! ?) 2 . 2 !) / 6 ! , \$ % - % B ' - % ^ !) 2 !
- % k 9 . - % 6 ! ? (! P & C " G ! p & % , . - % D % / , ! A % / % B . , 2 q ^ !) @ @ ' 9 / , 2 ! B ' - ! , \$ % ! 2 @ % \$ D % 2 !) 2 ! . B ! , \$ % (! Q % - % ! 6 % B . / % 6 ! @ ' / , - : ? 9 , . ' / ! 2 @ % \$ D % 2 d ! ! 7 2 !) ! - % 2 9 ^ , ^ ! , \$ % !

!

!
!

!\$%&'()*+%,%-. /-(!0' **%1%!
/,(/4+"\$4!-&,0&)+4("\$4!7+,(,-+!)0/55(%+\$0 !

!
!
!

	1232	122W	122!	122d	122^
]222!]222!]222!]222!]222!

JS0aTLIN!Lt>LS\J#f&L!700afS#!

! ! ! ! !

JS0aTL!

! ! ! ! !

P9/6./1!?' 6(!1-)/,2!

