```
!"#$%&'($)$%('&#($*#+$'+,!*$'
(,!$-%*"'&#($*#+$',.'./,*#&)'
0#)0#'&#1#(#,"'

""#$%&'(!)#*+,-!
#"#%&'&.!"/!0,%.1&2.-!
$.+,1$&1.!2#%$&1,34%&.5-!
6&+7,%!",%,3!+&2.1,5-!
0#8&,%!#1$.1&!#%&#542#%$&1,3-!
09#1!'#%+.5!#+:#%.!)#%'&#-!

-%)*#"2'*%3!%($%&'
!

1%*#.#%&'4%$#$#,'".,*'5*#$'
,.'-)6%)('+,*4!(')"&'+,07
4/)#"$'.,*'&%+/)*)$,*8'
)"&"&'&'*"#""""
```

```
!
% . 5 , +&1 ,!. 5 $&1 ,-!
$ # <& 2 &!" ,% , 3-!
:% # 1 (+&1!% # 2 . 5!) . 1 3 # + , 3-!
:% # 1 '&5' . !% &8 ,% .!8 # + ,% . 1-!
&% 8&1!2 ,7 . 3 #!5&+&5-!
) ,% #% 7 .!8 #% ) #5-!
7 #&% . 1!; #%% ,7 .!5 # 1 ' < , 3!
!
-/01%'&*#2 , .3&1%.%, .)# ,&*%, .%"!
&
=>?!
!
% , 1 ,!0 . 1 # $ < # 1!% . 5 # 5!' #% 7 , 1 # 5-!
# 7 %& # 1!5 . 5 #!: + ,$ ,5-!
# + ,0 # 1 7% .!: ,%% ,&% #!; .% ) ,5-!
```

```
2 #&( ,+!; ,$#1'.9%$-!
),+;,%!5.1$#*!:91,3-!
5&% 8 # 1&+7 .!; &; &# 1 .!5 . #%, 5-!
2 # * ( , +! 8 # + , % #!% # 2 &% , 3-!
, % 8 & 1!7 # 8 & 7!% . 7 # 5!", 7% .!
4"#50"1&."0,').)#,0/&*%,.%"!
        +678789:6;<=+>?8:7800<-!B>!EAF=GH!BH!IFA J 4
        @AGKA@!=>?!IFB@A!@L J LG=MGN!@LIO=IA?/!
K/!
2 \&' < \#, +! 6 /! 2, \# 7, -!!
: LAG?! . HHLPA! 7 LMAPIBM-! 2 L= J L!: LAG?! . HHLPA-!!
9/5/!& J J LQM=ILB>!=>?! 'O@IB J @!, >HBMPA J A>I-!
!
=>?!
6 &++&# 2!"/!; #%%-!
9>LIA?!5I=IA@!#IIBM>AN!) A>AM=G-!
```

!

#''**\$*,&!**+\$#,'''

!

!

 $R/ \quad \text{"AILILB>AN@4"G=L>ILHH@!eFAMA=HIAM!i" "AILILB>AN@jg!=MA!] B J A>!=>?! J A>!?AI=L>A?!EN!} \\ \text{"A@XB>?A>I@47 AHA>?=>I@!L>!PLKLG!L J J LQM=ILB>!?AIA>ILB>!=I!IFMAA!: GBML?=!?AIA>ILB>!PA>IAM@!] LIFL>!} \\ \text{IFA!"OML@?LPILB>!BH!IFA! 2 L= J L!: LAG?!. HHLPA!BH!& J J LQM=ILB>!=>?! 'O@IB J @!, >HBMPA J A>I!ei&', jg/!#GG!} \\ \text{"AILILB>AN@!=MA!=I!L J J L>A>I!ML@Y!BH!PB>IM=PIL>Q!PBMB>=KLMO@!?L@A=@A!T_RS!ei'. 8&74RSjg!=@!=!MA4} \\ \text{@OGI!BH!IFALM!L>=ELGLIN!IB!HBGGB}]! 'A>IAM!HBM!7L@A=@A!'B>IMBG!ei'7'jg!QOL?AGL>A@!=>?!@I=IA!=>?!GBP=G!} \\ \text{?LMAPILKA@!?OA!IB!IFALM!PB>IL>OA?!?AIA>ILB>/!$FL@!=PILB>!PF=GGA>QA@!IFA!MAHO@=G!BH!%A@XB>?A>I@!IB!} \\ \text{MAGA=@A!"AILILB>AN@-!=>?!BIFAM@!L>!IFA!PG=@@!IFAN!MAXMA@A>I-!@B!IF=I!IFAN!P=>!@FAGIAM!L>!XG=PA-!HBGGB]!} \\ \text{'7'!OOL?AGL>A@-!=>?!MA?OPA!IFALM!GLYAGLFBB?!BH!L>HAPILB>!=>?!LGG>A@@/!} \\ \end{aligned}$

 $T/ : A?AM=G!^O?QA@!=PMB@@!IFA!PBO>IMN!F=KA!BM?AMA?!IFA!OMQA>I!MAGA=@A!BH!>B>PLILkA>@-!A \XG=L>L>Q!IFA!XMA@@L>Q!FA=GIF!ML@Y@!PMA=IA?!EN!?AI=L>L>Q!QMBOX@!BH!XABXGA!=I!IFL@!IL J <math>A/^R$!!

Z/ .>!#XMLG!W-!T_T_-!9/5/!7L@IMLPI! 'BOMI!OO?QA! 6 LGGL= J!)/!*BO>Q!BM?AMA?!&',!IB!MA4 GA=@A!?AI=L>A?!L>?LKL?O=G@!EAP=O@A!BH!IFA!'. 8&74RS!IFMA=IC!i\$FA!@LIO=ILB>!L@!OMQA>I!=>?!O>XMAPA4

 $^{^{}R} \& '660\&6EFE-!G9CH8HI?=J?8K6<\&LE\&4?;;-!T_T_! 6 + !RUTSW[[!eSIF&'LM! 2 = M!TU-!T_T_g1! \$?;78:\& \$I:9M\&LE\&59>0-!'=@A!1B/!T_4PK4_mTa4\$0<45<(!e'/7/!'=G/!#XM/!T-!T_T_g-!, ':!1B/!RUI!''9N>6<& ''9B;8FI6M&LE&59>0-!T_4PK4_mT[4\$0<4$

?A>IA?-!=>?!/!/!/!=!MA?OPILB>!L>!IFA!>O J EAM!BH!XABXGA!] FB!=MA!FAG?!L>!PO@IB?N!L@!>APA@@=MN/j! 2 A J 4
BM=>?O J !=>?! . M?AM!=I!TW-! '?L8:9%LE& '9IM?-! '=@A! 1 B/!RCT_4PK4R_mR[4 6) *!e7/! 2 =@@/!#XM/!W-!
T_T_g!e7 , !mUg!ePBXN!=I!#XX\/!&-! , \F/!#-!R4TSg/!

!

 $U/ \qquad \$FA!@XMA=?!BH! ' . 8 \& 7 4RS!L>!\&' , !?AIA>ILB>!L>! : GBML?=!F=@!EAA>! J = MYA?!EN!@APMAPN! \\ =>?!PBKAM4OX/!!$

a/ #@!A=MGN!=@! 2 =MPF!T[-!T_T_-!GBP=G!=IIBM>AN@!MAXBMIA?!IB!IFALM!KBGO>I=MN!E=M!=@@BPL4

=ILB>!IF=I!IFALM!iPGLA>I@!F=KA!L>?LP=IA?!IFAMA!=MA!@LPY!L>?LKL?O=G@!L>!?AIA>ILB>!GBP=GGN-!bO=M=>IL>A?!

L>?LKL?O=G@-!=>?!?AI=L>AA@!] A=ML>Q!XMBIAPILKA!QA=M/j!e#XX\!&-!, \F/!O-!=I!Z_4ZT-!Z_!oR/g/!!#HIAM!=!

E=M!=@@BPL=ILB>!GL=L@B>! J A J EAM!=@YA?!&', !LH!IFAMA!] AMA!?AI=L>A?!L>?LKL?O=G@!] FB!F=?!IA@IA?!XB@L4

ILKA-!@FA!MAXBMIA?!E=PY!IB! J A J EAM@FLX!IF=I!iIFAMA!F=@!EAA>!1.!'.1:&%2#\$&.1!EN!&',!BH!?A4

I=L>AA@!=I!; \$'!BM!(MB J A!] FB!F=KA!IA@IA?!XB@LILKA!HBM!'.8&74RSp!=>?!MAHAMMA?! J A J EAM@!IB!

&', `@!] AE@LIA!] FAMA!LI!MAXBMI@!PB>HLM J A?!XB@LILKA!P=@A@/!e)B/g!eA J XF=@L@!L>!BMLQL>=Gg/!

m/ . >! 2 B>?=N-!#XMLG!m-!T_T_-!IFA! 2 L= J L!<AM=G?!MAXBMIA?!IF=I!I] B!BHHLPAM@!] BMYL>Q!
=I! (MB J A!5AMKLPA! "MBPA@@L>Q! ' A>IAM!L>! 2 L= J L!F=?!IA@IA?!XB@LILKA!HBM! ' . 8 & 7 4RS-!=>?! J =>N!BIF4
AM@!] AMA!=] =LIL>Q!MA@OGI@!HMB J !IFALM!IA@I@/!e#XX\!&-!, \F/! '-!=I!ZZ4ZW/g!

PA>IAM!IA@IA?!XB@LILKA!HBM! ' . 8 & 7 4RS-!LI`@!=G@B!>BI!PB J XGAIAGN!=PPOM=IA!=@!IA@IL>Q!L@!>BI!PB>?OPIA?!

B>!@LIA!=>?!?AI=L>AA@!=MA!@A>I!IB!=>!BHH4@LIA!FB@XLI=G!IB!EA!IA@IA?/j!!e#XX\!&-!, \F/!7-!=I!UR/g!

 $S/ \& ' , !>B] !=? J L!@!IF=I!IFAMA!=MA!GA=@I!I] B!?AI=L>A?!L>?LKL?O=G@!L>! 2 L= J L!] FB!F=KA! \\ IA@IA?!XB@LILKA!HBM! ' . 8 \& 7 4RS-!B>A!POMMA>IGN!=I! (MB J A-!=>?!=!@APB>?!=I!=!GBP=G!FB@XLI=G!L>! 2 L4 \\ = J L/^{T}!$

R_/ & ', !MAHO@A@!IB!?L@PGB@A!] FAIFAM!IFLM?4X=MIN!PB>IM=PIBM@!IA@I!XB@LILKA!HBM! '. 8 & 7 4

RS-!XMBKL?L>Q!IFA J !=!iGBBXFBGAj!IB!MAXBMIL>Q!IFA!=PIO=G!>O J EAM!BH! '. 8 & 7 4RS!P=@A@!= J B>Q!LI@!

A J XGBNAA@!L>!?AIA>ILB>!PA>IAM@/!\$FLM?4X=MIN!PB>IM=PIBM@!PB J XML@A!=! J =^BMLIN!BH!A J XGBNAA@!L>!?A4

IA>ILB>!PA>IAM@/!!e#XX\!&-!, \F/!7-!=I!Za4Zm/g!

RR/ '. 8 & 7 4RS!IFMA=IA>@!AKAMN!] B J =>!=>?! J =>!?AI=L>A?!=I! (MB J A!5AMKLPA!"MB4

PA@@L>Q! 'A>IAM!ei (MB J Ajg-!) G=?A@! 'BO>IN!7 AIA>ILB>! 'A>IAM!ei) G=?A@jg-!=>?!; MB] =M?!\$M=>@L4

ILB>=G! 'A>IAM!ei; \$ 'jg/!#!PF=MI!BH!IFA!MAXBMIA?!'. 8 & 7 4RS!P=@A@!BH!XABXGA!L>!&',!?AIA>ILB>!?A4

XLPI@!=>!=G=M J L>Q!@IAAX!POMKA/!e#XX\!&-!, \F/!, -!=I!U[gl!<66&?><9!7 APG=M=ILB>!BH!7 M/!OB@AXF!5FL>-!

2 7-! 2 5P!?=IA?!#XMLG!RZ-!T T !ei5FL>!7 APG/jg!ooZS4URe, \F/!Tg/!

RT/ #GIFBOQF! (MB J A-!) G=?A@-!=>?!; \$ '!=MA!MO>!EN!XMLK=IA!XML@B>!QMBOX@-!L>?AXA>?A>I!

PB>IM=PIBM@-!=>?!=!PBO>IN-!IFA@A!QMBOX@!F=KA!: 9!=OIFBMLIN!IB!MAGA=@A!=!XAM@B>/! . >GN!IFA!HA?AM=G!

OBKAM> J A>I!%A@XB>?A>I@!P=>!XMBKL?A!IFA!MA J A?N!MAbOA@IA?!EN!IFL@!=PILB>/!

RZ/ ,=PF!BH!IFA!IFMAA!?AIA>ILB>!PA>IAM@!ALIFAM!F=@!PB>HLM J A?!P=@A@!BH!IFA!KLMO@!BM!F=@!

QMBOX@!BH!L>?LKL?O=G@!FAM?A?!IBQAIFAM!L>!iPBFBMI!bO=M=>IL>Aj!EAP=O@A!IFAN!F=KA!EAA>!A\XB@A?/!

%=IFAM!IF=>! J LILQ=IA!IFA!ML@Y!BH!IM=>@ J L@@LB>-!IFA@A!PBFBMI!bO=M=>IL>A@!?M=@ILP=GGN!L>PMA=@A!IFA!

T'#+%'2:;<=>?@'A>'+, 1#&7BCD'EF=GH': I<=H@<') IJK'BLD'MLMLD'NOPN'4 0 (D'=!''#\$'''\$\&'''(0') FIIX@Cff]]]/LPA/QBKfPBMB>=KLMO@\bar{L}'

 $T_/ \qquad 9 > ?AM!IFA@A!PLMPO J @I=>PA@-! ' . 8 \& 7 4RS!] LGG! i @XMA=?!GLYA!] LG?HLMA-j !=PPBM?L>Q!IB!=! \\ HBM J AM!FLQF4GAKAG!\&' , !BHHLPL=G/!!e # XX \ !\&-! , \ F/!) -!=I! [U4WR-! [a4[m!omg!e?APG=M=ILB>!BH!0BF>!5=>?4] \\ AQ-! : BM J AM! # PIL>Q! 7 LMAPIBM!BH!&' , <math>g/Z$!!\$FA! 6 BMG?! < A=GIF! . MQ=>Lk=ILB>-!MAPBQ>LkL>Q!IFA!IFMA=I!

!

 $TT/ \qquad 7 \text{ AI=L>AA!MAXBMI@!HMB J !=GG!IFMAA!H=PLGLILA@!?BPO J A>I!IF=I!@BPL=G!?L@I=>PL>Q!L@!L J XB@4} \\ @LEGA-!XABXGA!A \FLELIL>Q!HGO4GLYA!@N J XIB J @!=MA!FBO@A?!L>!IFA!QA>AM=G!XBXOG=ILB>-!=>?! J =L>I=L>L>Q! \\ XAM@B>=G!FNQLA>A!L@!PB>@IM=L>A?!EN!IFA!PMB] ?A?!H=PLGLILA@!=>?!G=PY!BH!PGA=>L>Q!@OXXGLA@/!#I!; $'!=>?!) G=?A@-! J A>!=>?!] B J A>! J O@I!M=ILB>!@B=X!] AAYGN q$

 $Ta/ !\$FMBOQFBOI!IFA!] BMG?-!IFA! ' . 8\&74RS!X=>?AJLP!L@!L>HAPIL>Q!=>?!YLGGL>Q!] BJA>-! \\ JA>-!=>?!PFLG?MA>/!\$FA!9>LIA?!5I=IA@!F=@!>B] !@OMX=@@A?!IFA!MA@I!BH!IFA!] BMG?!L>!EBIF!IFA!>OJEAM! \\ BH!PB>HLMJA?!P=@A@!=>?!IFA!FLQFA@I!>OJEAM!BH!?A=IF@/! . KAM!TT-!___!#JAMLP=>@!F=KA!?LA?/^m!!, \4$

TW/ 9>HBMIO>=IAGN-!&', !L@!XMAKA>IL>Q!XABXGA!=I! (MB J A-!) G=?A@-!=>?!; \$ '!HMB J !PB J 4

XGNL>Q!] LIF!@FAGIAML>Q!L>!XG=PA!XMBIBPBG@!=>?! '7 '!QOL?AGL>A@/!7 A@XLIA!] =M>L>Q@!HMB J! J A?LP=G!

=>?!XOEGLP!FA=GIF!XMBHA@@LB>=G@!IF=I!MAGA=@L>Q!?AI=L>A?!L J J LQM=>I@!L@!IFA!B>GN!KL=EGA!BXILB>!IB!

PB J XGN!] LIF!@BPL=G!?L@I=>PL>Q-!L>?LKL?O=G!bO=M=>IL>A-!=>?!BIFAM! '7 '!MAbOLMA J A>I@!=>?!GBP=G!=>?!

@I=IA!BM?AM@-!IFA!=QA>PN!F=@!QA>AM=GGN!MAHO@A?!IB!MAGA=@A!L>!=>N! J A=>L>QHOG!] =N-!L>!IFA!=E@A>PA!BH!

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ZR/ "AILILB>AM!) 4) *#+#, '4¼'9%*, "#0, !L@!=!PLILkA>!BH!) O=IA J =G=!] FB!L@!?AI=L>A?!

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 $FL@!O>LI!=MA!KAMN!@LPY/!\&H!MAGA=@A?-!FA!F=@!I\]\ B!XG=PA@!IB!@I=N!L>!+=YA!\ 6\ BMIF-!\]\ LIF!FL@!X=MI>AM!=>?!$ $PFLG?MA>!=>?!\]\ LIF!FL@!EMBIFAM-!\]\ FAMA!FA!P=>!XM=PILPA!@BPL=G!?L@I=>PL>Q!=>?!@AGH4bO=M=>IL>A/!$ Z[/

=EBOI!PB>IM=PIL>Q! ' . 8 & 7 4RS-!] FLPF!] BOG?!EA!H=I=G!?OA!IB!FAM!XBBM!FA=GIF/!\$FA!PAGG@!=>?!XB?@!
=MA!@B!@ J =GG!\$=FL J L!P=>>BI!XM=PILPA!@BPL=G!?L@I=>PL>Q-!=>?! J =>N!BH!IFA!XABXGA!L>!FAM!XB?!=MA!@LPY/!
&H!MAGA=@A?!HMB J !?AIA>ILB>-!@FA!] BOG?!GLKA!] LIF!FAM!X=MI>AM!L>!<L=GA=F-!:GBML?=!] FAMA!@FA!] BOG?!
EA!=EGA!IB!@AGH4bO=M=>IL>A!=>?!XM=PILPA!@BPL=G!?L@I=>PL>Q/!

"AILILB>AM!.*) "R/#"'*) 0, "'2, "S)/%S!L@!=!>=ILB>=G!BH!IFA!7BJL>LP=>!

!5FA!L@! | BMMLA?!

%AXOEGLP!] FB!F=@!EAA>!?AI=L>A?!=I!) G=?A@! 'BO>IN!7 AIA>ILB>! 'A>IAM!@L>PA!: AEMO=MN!TU-!T_T_/!<A!
F=?!
/!<A!@OHHAM@!HMB J
!
17 OA!IB!IFA@A!

A\L@IL>Q!FA=GIF!L@@OA@-!L>!X=MILPOG=M!IFB@A!MAG=IA?!IB
!FA!L@!=I!=!FLQF!ML@Y!

HBM!H=I=G!PB J XGLP=ILB>@!LH!FA!] AMA!IB!PB>IM=PI! '. 8 & 7 4RS/!<L@!PAGG J =IA@!=MA!KAMN!@LPY-!=>?!IFAMA!L@!
>B!] =N!IB!@BPL=GGN!?L@I=>PA!L>!FL@!"B?!BM!PAGG!EAP=O@A!IFAMA!L@!>BI!A>BOQF!MBB J /!&H!MAGA=@A?-!FA!

LGG!GLKA!] LIF!FL@!EMBIFAM!L>! (L@@L J J AA-! : GBML?=!] FAMA!FA!] LGG!EA!=EGA!IB!XM=PILPA!@BPL=G!?L@I=>P4
L>O/!!

UR/ "AILILB>AM! 0) #R% / '6%\$) " + , ! * \$'L@!=!PLILkA>!BH! 'OE=!] FB!L@!?AI=L>A?!=I!
; MB] =M?!\$M=>@LILB>=G! 'A>IAM!=>?!AGLQLEGA!HBM!=?^O@I J A>I!O>?AM!IFA! 'OE=>!#?^O@I J A>I!#PI/!<A!

F=@!EAA>!L>!&', !PO@IB?N!@L>PA! 2 =MPF!Tm-!T_T_/!<A!@OHHAM@!HMB J !

! \ L@!
! \ L@!
! \ L@!
! \ L@!

RS/! < A!L@!] BMMLA?!EAP=O@A! J B@I!BH!IFA!IL J A!LI!L@!L J XB@@LEGA!HBM!FL J !IB!@BPL=G!?L@I=>PA/!&H!MAGA=@A?-!
FA!] LIF!FL@!=O>I!L>! 1 A] !OAM@AN-!] FAMA!@FA!F=@!=!@AX=M=IA!MBB J !HBM!FL J !IB!@AGH4L@BG=IA/!

UT/ "AILILB>AM!.*) "+#(+,'*#1%*,'1)/%*, "!L@!=!G=]HOG!XAM J =>A>I!MA@L?A>I!BH!

IFA!9>LIA?!5I=IA@!]FB!L@!?AI=L>A?!EN!&',!=I!)G=?A@!'BO>IN!7AIA>ILB>!'A>IAM/!<A!F=@!EAA>!L>!

&',!PO@IB?N!@L>PA!O=>O=MN!Tm-!T_T_/!<A!@OHHAM@!HMB J!

!<A!L@!XMA@PMLEA?!

!FL@! J A?LP=G!PB>?LILB>@/!#@!=!PB>@AbOA>PA!BH!FL@!FA=GIF!PB>?LILB>@-!FA!L@!=I!

FLQF!ML@Y!HBM!@AKAMA!LGG>A@@!BM!?A=IF!LH!FA!PB>IM=PI@! ' . 8 & 7 4RS/!\$FAMA!=MA!Sm!?AI=L>AA@!L>!FL@!XB?-!

=>?!=GG!Sm! J A>!F=KA!IB!@F=MA!B>A!IBLGAI/!&H!MAGA=@A?-!FA!] LGG!GLKA!] LIF!FL@!] LHA!L>! 1 =XGA@-! : GBML?=!

] FAMA!FA!] LGG!HBGGB] !=GG!MAPB J J A>?=ILB>@!HMB J !IFA! ' 7 '/!

UZ/ "AILILB>AM! **2 % / 6 % * '(, '' \$) 8 '.! ''% S**!&@!=!PLILkA>!BH!) O=IA **J** =G=!] FB!L@!?A4

I=L>A?!EN!& ' ,!=I!; MB] =M?!\$M=>@LILB>=G! 'A>IAM/!<A!F=@!EAA>!L>!& ' ,!PO@IB?N!@L>PA!=XXMB\L **J** =IAGN!

. PIBEAM!TW-!T_RS/!<A!@OHHAM@!HMB **J** !

!\$FAMA!F=KA!EAA>!QMBOX@!BH! J A>!IM=>@HAMMA?!L>IB!; \$ '-!=>?!FA!L@!O>@OMA!LH!IFAN!F=KA!EAA>!

IA@IA?!HBM! ' . 8&74RS/!<A!L@!PB>PAM>A?!EAP=O@A!FA!F=@!EAA>!

!EOI!FA!F=@!>BI!EAA>!

IA@IA?!HBM! ' . 8&74RS!BM!F=?!FL@!IA J XAM=IOMA!I=YA>/!&H!FA!L@!MAGA=@A?-!FA!] LGG!GLKA!] LIF!FL@!] LHA!BM!

FL@!@XB>@BM!L>!+AFLOF!#PMA@-!:GBML?=/!

UU/ "AILILB>AM!9!)"'+)*/,(')/.)*,'2)*+#)!L@!=!PLILkA>!BH! 2 A\LPB!=>?!=@N4

GO J !@AAYAM!] FB!L@!?AI=L>A?!EN!&',!=I! (MB J A!5AMKLPA!"MBPA@@L>Q! 'A>IAM/!<A!F=@!EAA>!L>!&',!PO@4

IB?N!@L>PA!B>!BM!=MBO>?! 2 =MPF!m-!T_T_/!<A!@OHHAM@!HMB J !] FLPF!XOI@!FL J !=I!FLQF!ML@Y!HBM!

@AKAMA!LGG>A@@!BM!?A=IF!LH!FA!PB>IM=PI@!'. 8&74RS/!<A!L@!] BMMLA?!EAP=O@A! J =>N! J A>!L>!FL@!PAGG!

F=KA!HAKAM@!=>?!PBOQF@/! 6 FA>!IFAN!=MA!L>!IFALM!O>LI-!LI!L@!L J XB@@LEGA!IB! J =L>I=L>!@BPL=G!?L@I=>PA/!

&H!MAGA=@A?-!FA!] BOG?!EA!=EGA!IB!@I=N!] LIF!FL@!] LHA!L>!: GBML?=!] FAMA!FA!] BOG?!EA!=EGA!IB!XM=PILPA!

@BPL=G!?L@I=>PL>Q/!

! !	!		

! !	!		

XAM@B>=G!XMBIAPILKA!AbOLX J A>I!BM!@=>LI=MN!@OXXGLA@!L>!IFA!H=PLGLIN/!&H!MAGA=@A?-!FA!] BOG?!EA!=EGA!IB!
@I=N!] LIF!FL@!QLMGHMLA>?!L>! 2 L= J L-!: GBML?=!] FAMA!FA!] BOG?!EA!=EGA!IB!@AGH4L@BG=IA!=>?!@AGH4bO=M=>4

IL>A/!!

aR/ "AILILB>AM! **0 ! -) 0 0) &') /) 0 'R -) "**!L@!=!PLILkA>!BH!"=YL@I=>!] FB!L@!?AI=L>A?!

=I! (MB J A!5AMKLPA!"MBPA@@L>Q! ' A>IAM/! < A!F=@!EAA>!L>!&', !PO@IB?N!@L>PA! 7 APA J EAM!R_-!T_RS/! < A!

@OHHAM@!HMB J !

/!#@!=!PB>@AbOA>PA!BH!FL@!

 $FA=GIF!PB>?LILB>@-!FA!L@!=I!FLQF!ML@Y!HBM!@AKAMA!LGG>A@@!BM!?A=IF!LH!FA!PB>IM=PI@! ' . 8\&74RS/!<A!L@! \\] BMMLA?!EAP=O@A!IFAMA!=MA!=XXMB\L J=IAGN!Ua!BIFAM!?AI=L>A?!L>?LKL?O=G@!FBO@A?!] LIF!FL J-!=>?!LI! \\ L J XB@@LEGA!HBM!IFA J !IB!MA J=L>!@L\!HAAI!=X=MI/!&H!MAGA=@A?-!FA!] BOG?!QB!E=PY!FB J A!=>?!GLKA!] LIF! \\ FL@!] LHA!=>?!PFLG?MA>!L>!$=J=M=P-!:GBML?=/!!!!$

aT/ "AILILB>AM!9, (%'+-) 1%S!L@!=!PLILKA>!BH!?OM=@!] FB!L@!?AI=L>A?!=I! (MB J A!

5AMKLPA! "MBPA@@L>Q! 'A>IAM/!<A!F=@!EAA>!L>!&', !PO@IB?N!@L>PA!OOGN!RS-!T_RS/!<A!@OHHAM@!HMB J!

/!<A!F=@!=!FL@IBMN!BH!EAL>Q!FB@XLI=GLKA?!HBM!

?OA!IB!FL@!XBBM!

FA=GIF/!#@!=!PB>@AbOA>PA!BH!FL@!

!FA!L@!=I!FLQF!ML@Y!HBM!@AKAMA!LGG4

>A@@!BM!?A=IF!LH!FA!PB>IM=PI@!'. 8&74RS/!OB@A!L@!L>!=!O>LI!] LIF!UR! J A>-!=>?!IFAN!=MA!>BI!=EGA!IB!

@BPL=GGN!?L@I=>PA!?OA!IB!IFA!PGB@A!bO=MIAM@!L>!] FLPF!IFAN!=MA!YAXI/!&H!MAGA=@A?!FA!] BOG?!EA!=EGA!IB!
GLKA!] LIF!FL@!@XBO@A!=>?!PFLG?MA>!L>!7=KLA-!:GBML?=!] FAMA!FA!] BOG?!EA!=EGA!IB!XM=PILPA!@BPL=G!?L@4
I=>PL>Q!=>?!@AGH4bO=M=>IL>A/!!

aZ/ "AILILB>AM!&) #*, "'6) **%&,'() "+ - %S!L@!=!PLILkA>!BH! 'OE=!] FB!L@!?A4

I=L>A?!=I!) G=?A@! 'BO>IN!7 AIA>ILB>! 'A>IAM!=>?!AGLQLEGA!HBM!=?^O@I J A>I!O>?AM!IFA! 'OE=>!#?^O@I4

J A>I!#PI/!<A!F=@!EAA>!L>!&', !PO@IB?N!@L>PA!: AEMO=MN!RZ-!T_T_/!7=MLB>!@OHHAM@!HMB J



!\$FAMA!=MA!BKAM!S_! J A>!L>!IFA!GLKL>Q!O>LI-!=>?!LI!L@!L J XB@@LEGA!IB! J =L>I=L>!

@L\!HAAI!BH!?L@I=>PA!=] =N!HMB J !BIFAM!?AI=L>A?!L>?LKL?O=G@/!&H!MAGA=@A?-!FA!] LGG!GLKA!] LIF!FL@!X=MI>AM!

=>?!PFLG?!L>! . MG=>?B-!:GBML?=!] FAMA!FA!] BOG?!EA!=EGA!IB!XM=PILPA!@=HA!@BPL=G!?L@I=>PL>Q!=>?!@AGH4

bO=M=>IL>A/!

aU/ "AILILB>AM! 0) 8 R%/'1) /%*)'*) 0 #*%S'L@!=!PLILkA>!BH! 'OE=!] FB!L@!?AI=L>A?!

=I!; MB] =M?!\$M=>@LILB>=G!'A>IAM/!<A!F=@!EAA>!L>!&',!PO@IB?N!@L>PA!7APAJEAM!T_RS/!<A!@OHHAM@!

HMBJ!

!HBM!FL@!PB>?LILB>/!

<A!L@!] BMMLA?!=EBOI!PB>IM=PIL>Q! ' . 8 & 7 4RS!EAP=O@A!BIFAM!?AI=L>A?!L>?LKL?O=G@!XMAX=MA!IFA!HBB?!
=>?!PGA=>!IFA!H=PLGLIN-!=>?!IFAN!?B!>BI!] A=M! J =@Y@-!=>?!@B J AIL J A@!QGBKA@-!] FLGA!PGA=>L>Q/!<A!L@!
PB>PAM>A?!IF=I!FL@!FA=GIF!PB>?LILB>@-!PBOXGA?!] LIF!IFA!H=PI!IF=I!FA!P=>>BI!@BPL=G!?L@I=>PA!] FLGA!
?AI=L>A?-!XOI@!FL J !=I!=!FLQFAM!ML@Y!BH!PB>IM=PIL>Q! ' . 8 & 7 4RS/!&H!FA!L@!MAGA=@A?!HMB J !?AIA>ILB>-!FA!
] LGG!GLKA!] LIF!FL@!PBO@L>!L>!"=@PB-! 6 =@FL>QIB>/!

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Case 1:20-cv-21553-XXXX Document 1 Entered on FLSD Docket 04/13/2020 Page 23 of 111
     !
     '. 8 & 7 4RS!=I! ( MB J A-!X=MILPOG=MGN!L>!KLA ] !BH!FL@!PFMB>LP!LGG>A@@/!&H!MAGA=@A?-!FA! ] BOG?!EA!=EGA!IB!
     GLKA! ] LIF!FL@!EMBIFAM!L>!+=MQB-!: GBML?=! ] FAMA!FA!PBOG?!@AGH4bO=M=>IL>A/!!
                     "AILILB>AM!")#0')**) R'L@!=!PLILkA>!BH!$O>L@L=!]FB!L@!?AI=L>A?!=I!(MBJA!5AM4
             am/
     KLPA! "MBPA@@L>Q! 'A>IAM/! < A!F=@!EAA>!L>!&', !PO@IB?N!@L>PA!OOGN!T-!T RS/! < A!@OHHAM@!HMB J!
                                                                          !<A!L@!KAMN!PB>PAM>A?!EAP=O@A!
     FA! ] = @!IBG?!IFMAA!BHHLPAM@!IA@IA?!XB@LILKA-!=>?!FA!IFL>Y@!B>A!BH!IFB@A!BHHLPAM@!F=@!@ILGG!EAA>! ] BMY4
      L>Q!L>!IFA!H=PLGLIN/!\#G@B-!@I=HH!=MA!>BI!O@L>Q!IFA!=XXMBXML=IA!XAM@B>=G!XMBIAPILKA!AbOLX\ J\ A>I!=>?!=MA!
     @ILGG!?BL>Q!IFMAA!@F=YA!?B]>@!BH!IFALM!EO>Y@!=!?=N-!IBOPFL>Q!=GG!BH!IFA! J A>d@!XAM@B>=G!EAGB>QL>Q@/!
     &H!MAGA=@A?-!FA!P=>!@I=N! 1 LIF!FL@!=?BXILKA!PLILkA>!X=MA>I@!L>! 8 LMOL>L=! 1 FAMA!FA! 1 LGG!F=KA!FL@!B 1>!
     MBB J !IB!L@BG=IA!=>?!@BPL=G!?L@I=>PA/!!
                     "AILILB>AM!) 2)"%'5)*() 0%'L@!=!PLILkA>!BH!5BJ=GL=!]FB!L@!?AI=L>A?!=I!(MBJA!
             a[/
     5AMKLPA!"MBPA@@L>Q!'A>IAM/!<A!F=@!EAA>!L>!&',!PO@IB?N!@L>PA!#QQQ@I!R-!T R[/!<A!@OHHAM@!HMBJ!
                             =>?!]=@!=!PFMB>LP!@JBYAM!EAHBMA!XG=PA?!L>!&',!PO@IB?N/!
                                  /!<A!L@!IAMNLHLA?!IF=I!FA!]LGG!PB>IN=PI!'.8&74RS!EAP=O@A!IFA!?A4
                                                        !9>LI!=MA!>BI!EAL>0!L@BG=IA?-!=>?!=!?AI=L>AA! ] FB!
     I=L>A?!L>?LKL?O=G@! ] LIFL>!IFA!
     O@A?!IB!EA!FBO@A?!L>!IFA!O>LI!L@!>B]!L@BG=IA?!=I!=!FB@XLI=G/!<A!L@!]LIFL>!@L\!HAAI!BH!=>BIFAM!XAM@B>!
                                 /!&H!MAGA=@A?!HNB J !?AIA>ILB>-!FA! ] LGG!MAION>!IB!GLKA! ] LIF!FL@! ] LHA!L>!
     =I!=GG!IL J A@! 1 LIFL>!IFA!
     <OIPFL>@B>-! 2 L>>A@BI=/!
                     "AILILB>AM! - ) ( ( ) "' 0 , - ) 0 %&'.) * ) - 'L@!=!PLILkA>!BH!5BJ=GL=! ] FB!L@!?A4
             aW/
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aW/ "AILILB>AM! -) (() "' 0 , -) 0 %&'.) *) - 'L@!=!PLILKA>!BH!5B J =GL=!] FB!L@!?A4

I=L>A?!=I! (MB J A!5AMKLPA! "MBPA@@L>Q! ' A>IAM/! < A!F=@!EAA>!L>!&' , !PO@IB?N!@L>PA! . PIBEAM!Rm-!T_R[/!

<A!@OHHAM@!HMB J !

! < A!L@!FBO@A?!L>!IFA! /!5B J A!BH!IFA! J A>!L>!FL@!O>LI!=MA!A\FLELIL>Q!H6O!

@FB] AM!MAQOG=MGN/!

!

!&H!MAGA=@A?-!

FA!] LGG!GLKA!] LIF!FL@!] LHA!=>?!PFLG?MA>!L>! 2 L>>A@BI=!] FAMA!FA!] LGG!HBGGB] !IFA! 2 L>>A@BI=!@I=N!=I!

FB J A!BM?AM!=>?!@I=N!L>!L@BG=ILB>/!!

aS/ "AILILB>AM!*!6%"',*/)"&,'./,*%('*)0,(!L@!=!U_4NA=M!BG?!PLILkA>!BH!

?OM=@!]FB!L@!?AI=L>A?!=I!(MB J A!5AMKLPA!"MBPA@@L>Q!'A>IAM/!<A!F=@!EAA>!L>!&',!PO@IB?N!

@L>PA!2=MPF!S-!T_T_/!<A!@OHHAM@!HMB J!

-!=>?!@L>PA!FL@!IL J A!L>!

(MB J A!FL@!

!>APA@@LI=IL>Q!L>PMA=@A?! J A?LP=ILB>/!<A!F=@!

=G@B!EAA>!F=KL>Q!?LHHLPOGIN!EMA=IFL>Q/!<A!L@!L>!=!bO=M=>IL>A!PBFBMI!O>LI!=>?!L@!O>=EGA!IB!@=HAGN!

15B J A!

!

J A>!=MA>`I!=GGB] A?!IB!O@A!IFA!XFB>A!IB!PB>I=PI!IFALM!=IIBM>AN@!EAP=O@A!IFAN!F=KA!MAXBMIA?!IFA!

QO=M?@!PB>?OPI/!&H!MAGA=@A?-!FA!] BOG?!GLKA!] LIF!FL@!H= J LGN!L>! 1 A] ! . MGA=>@-!+BOL@L=>=!] FAMA!FA!

PBOG?!I=YA!P=MA!BH!FL J @AGH!=>?!@AX=M=IA!FL J @AGH!HMB J !BIFAM@/!

?L@I=>PA!FLJ@AGH!HMBJ!IFA!MA@I!BH!IFA!JA>/!7OA!IB!=!G=PY!BH!@FB1AM@-!IFA!JA>!=MA!>BI!=EGA!IB!

!\$FA! (MB J A!@I=HH!=>?!>OM@A@!=MA!IAGGL>Q!FL J !IF=I!IFAMA!=MA!XABXGA!L>!f (2 FFAMA!L&L=01 2 7 2 .

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!; AP=O@A!BH!FL@!O>?AMGNL>Q! J A?LP=G!PB>?L4

ILB>-!FA!L@!=I!ML@Y!HBM!H=I=G!PB J XGLP=ILB>@!LH!FA!] AMA!IB!PB>IM=PI! ' . 8&74RS/!<A!L@!PB>PAM>A?!EA4
P=O@A!FA!L@!O>=EGA!IB!@BPL=G!?L@I=>PA-!A@XAPL=GGN!?OML>Q! J A=G@!] FAMA!AKAMNB>A!L@!B>GN!=EBOI!IFMAA!
HAAI!=X=MI/!&H!MAGA=@A?-!FA!] LGG!MAIOM>!FB J A!=>?!GLKA!] LIF!FL@!] LHA!=>?!HBGGB] ! ' 7 ' !MAPB J J A>?=4
ILB>@/!

mU/ %A@XB>?A>I! **0** #+ -) % / ' **5** K' **0** %) &%!L@!IFA!: LAG?! . HHLPA! 7 LMAPIBM!HBM!IFA!& ' ,! 2 L4

= J L!: LAG?! . HHLPA!!\$FA!& ' ,! 2 L= J L!: LAG?! . HHLPA!F=@!PB J XGAIA!PB>IMBG!BKAM!IFA!=? J L@@LB>!=>?!MA4

GA=@A!BH!>B>PLILkA>@!?AI=L>A?!=I! (MB J A-!; \$ '-!=>?!) G=?A@!!!%A@XB>?A>I! 2 A=?A!L@!IFA!L J J A?L=IA!

=>?!GAO=G!PO@IB?L=>!BH!"AILILB>AM@!!!<A!L@!@OA?!L>!FL@!BHHLPL=G!P=X=PLIN!!!

ma/ %A@XB>?A>I! **5** # / /#) **0 '4**K'**6**) * * !L@!IFA! 9 >LIA?!5I=IA@!#IIBM>AN!) A>AM=G/!!&>!IFL@!

P=X=PLIN-!FA!F=@!@OXAMKL@BMN!=OIFBMLIN!BKAM!=GG!BXAM=ILB>!BH!IFA! , \APOILKA! . HHLPA!BH!& J J LQM=ILB>!

%AKLA] !e , . &%g!] FLPF!L>PGO?A@!=GG!IFA!L J J LQM=ILB>!PBOMI@!=>?!IFA! ; B=M?!BH!& J J LQM=ILB>!#XXA=G@!

e ; &#g/!!W! 9/5/ '/!uRR_ZeQg1!W! ' : %!uR_Z/_/!!<A!L@!=G@B!PF=MQA?!] LIF!IFA!=? J L>L@IM=ILB>!=>?!IFA!

A>HBMPA J A>I!BH!IFA!L J J LQM=ILB>!G=] @!O>?AM!W! 9/5/ '/!uRR_Ze=g/!!%A@XB>?A>I! ; =MM!L@!=!GAQ=G!PO@IB4

?L=>!BH! "AILILB>AM@/!!<A!L@!@OA?!L>!FL@!BHHLPL=G!P=X=PLIN/!!

4*,4,(%&'+/)(('

mm/ "AILILB>AM@!HLGA!IFL@!=PILB>!B>!EAF=GH!BH!=!FLQFGN!KOG>AM=EGA!XOI=ILKA!PG=@@C!=GG!L>?L4

KL?O=G@!L>!PLKLG!L J J LQM=ILB>!?AIA>ILB>-!=@!BH!IFA!?=IA!BH!IFA!HLGL>Q!BH!IFL@!=PILB>-!=I!IFMAA!: GBML?=!

?AIA>ILB>!PA>IAM@-! (MB J A!5AMKLPA! "MBPA@@L>Q! 'A>IAM-!; MB] =M?!\$M=>@LILB>=G! 'A>IAM-!=>?!) G=?A@!

'BO>IN!7AIA>ILB>! 'A>IAM/!, =PF!L>?LKL?O=G!L@!=I!L J J L>A>I!ML@Y!BH!PB>IM=PIL>Q! '.8&74RS!EAP=O@A!

 $BH!IFA!GLHA4IFMA=IA>L>Q!PB>?LILB>@!O>?AM!\]\ FLPF!IFAN!=MA!PB>HL>A?\ q\ PB>?LILB>@!IF=I!KLBG=IA!\ '\ 7\ '! \\ QOL?AGL>A@!=>?!5I=IA!=>?!\ 'BO>IN!BM?AM@!=@!IFAN!XAMI=L>!IB!\ '\ .\ 8\&74RS/!$

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 $\label{eq:maxma@a>I=ILKA@!BH!IFA!HBGGB]L>Q!XMBXB@A?!} $$ m[/ 1 = JA?!"AILILB>AM@!EML>Q!IFL@!=PILB>!=@!MAXMA@A>I=ILKA@!BH!IFA!HBGGB]L>Q!XMBXB@A?! $$ PG=@@C!$

#GG!PLKLG!L J J LQM=ILB>!?AI=L>A?!L>?LKL?O=G@!] FB!=MA!FAG?-!BM!] FB!] LGG!EA! FAG?-!EN!% A@XB>?A>I@!=I!IFA! (MB J A!5AMKLPA! "MBPA@@L>Q! 'A>IAM!ei (MB J Ajg-!IFA! ; MB] =M?!\$M=>@LILB>=G! 'A>IAM!ei ; \$ 'jg-!=>?!=I!) G=?A@! 'BO>IN!7AIA>ILB>!:=PLGLIN! ei) G=?A@jg!=@!BH!IFA!LL J A!BH!IFA!HLGL>Q!BH!IFL@!=PILB>!] FB!=MAC!

(:T7?F=GG') C!?AI=L>A?!L>?LKL?O=G@!] LIF!=!@I=EGA!GBP=ILB>!=>?fBM!XG=PA!BH!MA@L4?A>PN!L>!] FLPF!IFAN!P=>!@AGH4bO=M=>IL>A!=>?!XM=PILPA!@BPL=G!?L@I=>PL>Q!=>?!FN4QLA>A!XOM@O=>!!IB!IFA!'7'!QOL?AGL>A@!=>?!, \AP/!. M?AM!1B/!T_4SR!OXB>!MAGA=@A/!

(:T7?F=GG'6C!=GG!BIFAM!?AI=L>A?!L>?LKL?O=G@!]LIFBOI!=PPA@@!IB!=!@I=EGA!GBP=ILB>! =>?fBM!XG=PA!BH!MA@L?A>PN!L>!]FLPF!IFAN!P=>!@AGH4bO=M=>IL>A!=>?!XM=PILPA!@BPL=G! ?L@I=>PL>Q!=>?!FNQLA>A!XOM@O=>I!IB!'7'!500050.2 (H)#7000502.2 (F!IJei)0.2 R-0.2 (!=)0.2 (

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!
[T/ ) G=?A@!?AI=L>@!=>!=KAM=QA!BH!U_[!LJ JLQM=>I!?AI=L>A?!L>?LKL?O=G@!=I!=!ILJ A/!e#XX\!
&-!, \F/!(-!=I!Rma/g!
```

WR/: A?AM=G!?L@IMLPI!PBOMI@!F=KA!^OML@?LPILB>!IB!FA=M!F=EA=@!PG=LJ@!EN!>B>PLILkA>@!PF=G4

GA>QL>Q!IFA!G=] HOG>A@@!BM!PB>@ILIOILB>=GLIN!BH!IFALM!?AIA>ILB>!EN!7<5/! '660&6EFE0&Q?BLPB?<&LE&1?=

L8<-!aZZ!9/5/!m[W-!mW[!eT__Rg1!J6::8:F<&LE&"9B;8F16M-!RZW!5/! 'I/!WZ_!eT_RWg/!

WZ/ !"OM@O=>I!IB!LI@!^OML@?LPILB>-!IFL@! 'BOMI! J

 $50XX/!Z?!RRmW-!RRW[!e\ 1/7/!\ '=\emptyset/!T_R[g!eHL>?L>Q!IFA!@P=\emptyset!\ .\ \%\%!BHHLPL=\emptyset!@OE^API!IB!^OML@?LPILB>!L>!$

IFA! 1 BMIFAM>! 7 L@IMLPI!BH! '=GLHBM>L=!EAP=O@A!@FA!]=@!E=@A?!L>!5=>!: M=>PL@PBg/!

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<u>%U-)!(\$#,''',.')&0#''#(\$*)\$#1%'*%0%&#%('</u>

- \$\text{S_AMA!L@!>B!A\F=O@ILB>!MABOLMA J A>I!} \text{FAMA!=!XAILILB>AM!=@@AMI@!PB>@ILIOILB>=G!}

 PG=L J @!IF=I!IFA!=QA>PN!P=>>BI!=??MA@@/! '66\d. 6@6>\dLE\d"6:9-!S[T!:/!5OXX/!m_W-!mRm!e5/7/!:G=/!RSS[g!
 eC878:F\dO?878?:\d"6@IF66\d*7;\text{E-!W[T!:/T?!=I!Ram_g1!<66\d?><9\d**;?P79:\dLE\d**?>>?H?:-!RT_!!:/Z?!RTR[-!

 RTTT!eRRIF! 'LM/!RSS[g!ei , \F=O@ILB>! J =N!EA!A\PO@A?!] FA>!IFA!B>GN!PB>IA@IA?!L@@OA!L@!PB>@ILIO4

 ILB>=G-!PBGG=IAM=G!IB!IFA!PB>@L?AM=ILB>!BH!sIFAt!PG=L J !SEAHBMA!IFA!=QA>PNt-!=>?!LI@!MA@BGOILB>!IFAMA4

 HBMA!H=GG@!BOI@L?A!IFA!=QA>PN\@!=OIFBMLIN/jg1! 5 ?;<?K6\dLE\d2\text{E'E\dO779};:6P\d-6:\text{E-![Sm!:A?/!#XX\/!SSZ-!}

 R__m!eRRIF! 'LM/!T_T_g!ei ; AP=O@A!IFA!; \d#!?BA@!>BI!F=KA!IFA!XB] AM!IB!?APL?A!PB>@ILIOILB>=G!

 PG=L J @

! !

 $\&x 1!7 AP/!aTS-!aZT!e; \&\#!RSSTg!e>BIL>Q!IF=I!iLI!L@!@AIIGA?j!IF=I!IFA!LJJLQM=ILB>!^O?QA!=>?!IFA!; \&\#!P=>>BI!?APL?A!PB>@ILIOILB>=G!bOA@ILB>@g$

Sa/ &>HAPIA?!L>?LKL?O=G@!P=>!H=PA!XMBGB>QA?!IMA=IJA>I!=>?!MAPBKAMN!XAMLB?@-!MABOLML>Q! FLQFGN!=IIA>ILKA!FB@XLI=G!P=MA!=>?!KA>ILG=IBM@!IF=I!=MA!L>!L>PMA=@L>QGN!@FBMI!@OXXGN/!\$FB@A!]FB!?B! >BI!?LA!P=>!H=PA!@AMLBO@!?=J=QA!IB!IFA!GO>Q@-!FA=MI-!GLKAM-!BM!BIFAM!BMQ=>@/RR!

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 $Sm/ \quad 'B J XGLP=ILB>0!HMB J ! ' . 8 \& 7 4RS!P=>! J => LHA0I!=I!=>!=G=M J L>Q!X=PA/! "=ILA>I0!P=>!QB! \\ HMB J !EAL>Q! J A?LP=GGN!0I=EGA!] LIF!>B!>AA?!HBM!0OXXGA J A>I=G!B \ NQA>!IB!MAbOLML>Q!L>IOE=ILB>!=>?! \\ KA>ILG=IBM4=00L0IA?!EMA=IFL>Q!] LIFL>!TU!FBOM0/!5IO?LA0!A0IL J =IA!IF=I!IFA!=KAM=QA!GA>QIF!BH!IL J A! \\ HMB J !B>0AI!BH!0N J XIB J 0!IB!FB0XLI=GLk=ILB>!BM!IFA!?AKAGBX J A>I!BH!0AKAMA!0N J XIB J 0!L0!B>GN! [4S!?=N0/!] \\ ?=N0/!$

S[/ . 6?AM!L>?LKL?O=6@!=>?!IFB@A!] LIF!PAMI=L>!JA?LP=6!PB>?LILB>@!=MA!=I!X=MILPOG=MGN! $FLOF!ML@Y!HBM!@AMLBO@!LGG>A@@!BM!?A=IF!HMBJ!'.8\&74RS/^{RT}!$

SW/ 5L>PA!IFA!HLM@I!P=@A!] =@!MAXBMIA?!L>!7 APA J EAM!T_RS-!IFA!IM=>@ J L@@LB>!BH! ' . 8 & 7 4

RS!F=@!EAA>!QMB] L>Q!A\XB>A>IL=GGN/!! 6 BMG?] L?A-!IFA!>O J EAM!BH!MAXBMIA?!P=@A@!PGL J EA?!HMB J !R!IB!

R__-__!L>!m[!?=N@1!HMB J !R__-__!IB!T__-__!L>!B>GN!RR!?=N@1!=>?!HMB J !T__-_!IB!Z__-__!L>!

^O@I!U!?=N@/RZ!!

 $SS/ . >! 2 = MPF!RR-!T_T-!IFA! \ 6 \ BMG?! < A = GIF! \ . \ MQ = > Lk = ILB > !ei \ 6 < . \ jg!?APG = MA?!IFA!BOI4$ $EMA = Y! = !QGBE = G!X = > ?A \ J \ LP^{RU}! = > ?! \ ' \ . \ 8 \& 7 \ 4RS!F = @! > B \] \ !IBOPFA?! > A = MGN!AKAMN!PBO > IMN!B > !IFA!XG = > AI/^{Ra}!!$ $R \ / \ SFA! \ 6 < . \ !F = @!A \ FBMIA?!EBIF!L \ J \ J \ LQM = ILB > ! = > ?!PML \ J \ L > = G!^O@ILPA!?APL@LB > ! \ J = YAM@!IB!$

O@A!i>B>4PO@IB?L=G! J A=@OMA@j!IB!XMBIAPI!L>P=MPAM=IA?! J A>-!] B J A>-!=>?!PFLG?MA>!=>?!IB!@IA J !IFA!

A@P=G=IL>Q!IM=>@ J L@@LB>!M=IA/!e#XX\!&-!, \F/!<-!=I!STg!!!

R_R/ #@!BH!#XMLG!RT-!T_T_-!IFA!>O J EAM!BH!PB>HLM J A?!P=@A@!] BMG?] L?A!F=@!@OMX=@@A?!

B>A!=>?!=!F=GH! J LGGLB>-!L>PGO?L>Q!BKAM!am_-___!XABXGA!L>!IFA!9>LIA?!5I=IA@/!! . KAM!RRU-___!XABXGA!

F=KA!?LA?!=@!=!MA@OGI!BH!' . 8&74RS!] BMG?] L?A-!L>PGO?L>Q!=I!GA=@I!TT-___!L>!IFA!9>LIA?!5I=IA@/Rm!!

R_T/ 1 = ILB>= GGN-!XMB^APILB> @!EN!IFA! '7'!L>?LP=IA!IF=I!BKAM!T__! J LGGLB>!XABXGA!L>!IFA! 9>LIA?!5I=IA@!PBOG?!EA!L>HAPIA?!] LIF! '. 8 & 7 4RS!BKAM!IFA!PBOM@A!BH!IFA!X=>?A J LP!] LIFBOI!AHHAP4

 $[\]label{eq:fixed_$

 $^{^{}RU}!\$A? \texttt{MB@!} \#? \texttt{F=>B} \texttt{J} !) \texttt{FAEMANA@O@-!} 5 O \# \& 1 \$; 6C79; = -6:6;? \land \& 9A6:8: F \&; 6K?; R \land \& ?? \& 7 \& 7 \& 6B8? \& N; 86@8: F \& 9: \& * \# () 1 = Z [\& a \& ZZ \& $: CH \& D] D] !e 2 = M/!RR-!T_T_g-!FIIX@Cff]]]/] \texttt{FB}/L>If?Qf@XAAPFA@f?A4 I=LGf] \texttt{FB}4?LMAPIBM4QA>AM=G4@4BXA>L>Q4MA J=MY@4=I4IFA4 JA?L=4EMLAHL>Q4B>4PBKL?4RS444RR4 J=MPF4 T_T/!$

 $[\]begin{tabular}{ll} $R^m!$ 6 BMG?B J AIAMC! 'BMB>=KLMO@-!FIIX@Cff]]]/] BMG?B J AIAM@/L>HBfPBMB>=KLMO@f|PBO>IMLA@!eG=@I!=PPA@@A?!#XM/!RT-!T_g/! \\ \end{tabular}$

ZT!

9 > LIA?!5I=IA@-!IFA! > 0 J EAM!BH!PB>HLM J A?!P=@A@!L@!GLYAGN!EOI!=!HM=PILB>!BH!IFA!MOA! > 0 J EAM!BH! $^{'} . 8 \& 7 4RS!P=@A@! \text{] BMG?] L?A/!!#@!BH!#XMLG!RT-!T_T_-!^O@I!BKAM!T/W! J LGGLB>!IA@I@!F=KA!EAA>!=? J L>4$ $L@IAMA?!L>!IFA!A>ILMA!9>LIA?!5I=IA@1!L>!:GBML?=-!B>GN!RWU-STm/^{TZ!!};AP=O@A!BH!IFA!@FBMI=QA!BH!IA@I@!L>!$ $IFA!9>LIA?!5I=IA@ q=? J LIIA?!IB!EA!=!iH=LGL>Qj!EN!IBX!L>HAPILBO@!?L@A=@A!A\XAMI!7M/!#>IFB>N!$ $:=OPL^{TU} q IFA!' 7'!POMMA>IGN!MAPB J J A>?@!XMLBMLILKL>Q!IA@IL>Q!HBM!@N J XIB J =ILP!FA=GIFP=MA!XMBKL?4$ AM@!

?MBXGAI@!BM!IBOPFA@!=!PB>I= J L>=IA?!@OMH=PA?!=>?!IFA>!IBOPFA@!IFALM! J BOIF-!>B@A-!BM!ANA@/

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XMBXFNG=PILP! J A?LP=ILB>@!IF=I!] LGG!

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 $A \setminus IA>?L>Q!IB!m_! \ J \ LGGLB>!XABXGA!L>! \ 'FL>=/ZU!! : BGGB \] \ L>Q!IFA!GBPY?B \]>-! \ 6 \ OF=>!@= \] \ !=!@O@I=L>A?!?A4$ $PMA=@A!L>!IM=>@ \ J \ L@@LB>!BH! \ ' \ . \ 8 \& 7 \ 4RS-!=>?!I \] \ B! \ J \ B>IF@!G=IAM-!IFA!?=LGN!>O \ J \ EAM!BH!MAXBMIA?!P=@A@!$?MBXXA?!IB!kAMB/!

 $RRR/ \quad \$FMBOQFBOI!IFA! \] \ BMG?-!BIFAM!PBO>IMLA@!F=KA!=G@B!L \ J \ XGA \ J \ A>IA?!?M=@ILP!@BPL=G!?L@4 \ I=>PL>Q! \ J \ A=@OMA@!L>!=>!AHHBMI!IB!PB>IMBG!IFA! ' . 8 \& 7 4RS!X=>?A \ J \ LP!=>?!XMBIAPI!XABXGA`@!FA=GIF!=>?! \ GLKA@/!!: M=>PA-!HBM!A\= J \ XGA-!L \ J \ XB@A?!=!@IMLPI!>=ILB> J \ L?A!GBPY?B J >-!XMBFLELIL>Q!Q=IFAML>Q@!BH!=>N! \ GLKA!=>?!BM?AML>Q!=GG!MA@L?A>I@!IB!@I=N!=I!FB \ J \ A/Za!! . KAM=GG-!PBO>IMLA@!A>PB \ J \ X=@GL>Q!=>!A@IL \ J =IA?! \ B>A!IFLM?!BH!IFA! \ J \ BMG?`@!XBXOG=ILB>!F=KA!A>=PIA?!@L \ J \ LG=M!MA@IMLPILB>@/Zm!! \# PMB@@!IFA! 9>LIA?!5I=IA@-! \ PLILA@!=>?!@I=IA@!=MA!L \ J \ XB@L>Q!L>PMA=GL>QGN!@IML>QA>I! \ J \ A=@OMA@!IB!AHHAPIO=IA!@BPL=G!?L@I=>PL>Q/!!#@! \ BH! \# XMLG! \ [-!T_T_-!=I!GA=@I!UT!@I=IA@-!IFMAA!PBO>ILA@-!=>?!>L>A!PLILA@!F=?!BM?AMA?!IFALM!MA@L?A>I@!IB! \ i @FAGIAM!L>!XG=PAj!BM!@I=N!=I!FB \ J \ A/ZI!!!$

!!

!

;;K #>'J@GIA>G@'HA'HX@'+, 1#&7BC'I=><@W;?D'=FF'F@[@FG'AY'VA[@J>W@>H'X=[@'<;7 J@?H@<'I@AIF@'HA'GX@FH@J';>'IF=?@D'=><'IJ=?H;?@'GA?;=F'<;GH=>?;>V'=><'[;V;F=>H' X\V;@>@K'

RRT/ . >! 2 = MPF!R-!T_T_-!) BKAM>BM! 7 A5 => IL@!L@@OA?! , \APOILKA! . M?AM!T_4aR!?LMAPIL>Q!IFA! : GBML?=! 7 AX=MI J A>I!BH! < A=GIF!IB!L@@OA!=! "OEGLP! < A=GIF! , J AMQA>PN/!!

RRZ/ . >!IFA!@= J A!?=N-!IFA!5I=IA!5OMQAB>!) A>AM=G!=>?!5I=IA!<A=GIF! . HHLPA!?APG=MA?!IF=I!
=!"OEGLP!<A=GIF!, J AMOA>PN!A\L@I@!L>!IFA!5I=IA!BH!:GBML?=!=@!=!MA@OGI!BH!' . 8&74RS/!

RRU/ .>! 2 =MPF!S-!T_T_-!) BKAM>BM! 7 A5=>IL@!?APG=MA?!=!@I=IA!BH!A J AMQA>PN!HBM!IFA!A>4

ILMA!@I=IA!BH!: GBML?=-!?A@PMLEL>Q!IFA!@XMA=?!BH!' . 8 & 7 4RS!=@!i=!ML@Y!IB!IFA!A>ILMA!@I=IA!BH!: GBML?=/j!!

.\AP/! . M?AM! 1 B/!T 4aT/ZW!

RRa/ .>! 2 =MPF!RZ-!T_T_-!"MA@L?A>I!7 B>=G?!O/!\$MO J X!?APG=MA?!=!>=ILB>=G!A J AMQA>PN-!
=>?!B>! 2 =MPF!Rm-!T_T_-!IFA!"MA@L?A>I!=>?!IFA! ' 7 '!L@@OA?!QOL?=>PA!ILIGA?!iRa!7=N@!IB!5GB]!IFA!

5XMA=?-j!=?KL@L>Q!L>?LKL?O=G@!IB!=KBL?!@BPL=G!Q=IFAML>Q@!L>!QMBOX@!BH! J BMA!IF=>!R_!XABXGA!=>?!
=?KL@L>Q!BG?AM!XAM@B>@!=>?!XAM@B>@!] LIF!@AMLBO@!O>?AMGNL>Q!FA=GIF!PB>?LILB>@!IB!@I=N!FB J A!=>?!
=] =N!HMB J !BIFAM@/!

RRm/ . >! 2 =MPF!RS-!T_T_-! 2 =NBM!) L J A>Ak!L@@OA?! 2 L= J L47=?A! , J AMQA>PN! . M?AM!_[4 T_-!=?BXIL>Q! ' 7 ' !QOL?AGL>A@!A>PBOM=QL>Q!@BPL=G!?L@I=>PL>Q!=>?! J =L>I=L>L>Q!=!m4HBBI!@AX=M=ILB>! EAI] AA>!MA@L?A>I@!IB!@GB] !IFA!@XMA=?!BH!L>HAPILB>!=>?!IF=I!AKA>I@!] LIF! J BMA!IF=>!IA>!=IIA>?AA@! ALIFAM!EA!P=>PAGGA?!BM!FAG?!KLMIO=GGN/ZS!

ZW!!OL?8>?N>6&?7C!FIIX@Cff]]]/HGQBK/PBJf]X4PB>IA>IfOXGB=?@fT_T_f_Zf,.4T_4aT/X?H/!

 $^{^{}ZS}! \# K = LG = EGA! = IC! FIIX@Cff \] \] \] / \mathbf{J} \ L = \mathbf{J} \ L? = ?A/QBKfL > HBM \ \mathbf{J} = ILB > fGLEM = MNfPBMB > = KLMO@4A \ \mathbf{J} \ AMQA > PN4BM4 \\ ?AM4 _ [4T_4EO@L > A@@A@/X?H!]$

 $RR[/ ...] = PF!T_-!T_-! BKAM>BM! 7A5 = IL@!L@@OA?!, APOILKA!.M?AM!T_4[_!IB!iF=MJB4] \\ > LkAj!; MB] = P?!=>?!"=GJ!; A=PF!'BO>IN!] LIF! 2L=JL47 = PA-!BMPAML>Q!IFA!PGB@OMA!BH!=GG!MA@I=OM=>IQ-!E=M@-!=>N!BIFAM!=GPBFBGfHBBP!@AMKLPA!EO@L>A@@!A@I=EGL@FJA>I!] LIF!@A=IL>Q!HBM!JBMA!IF=>!R_!XABXGA-!L>!=?PLILB>!IB!=GG!JBKLA!IFA=IAM@-!PB>PAMI!F=GG@-!=OPLIBMLOJ@-!XG=NFBO@A@-!EB] GL>Q!=GGAN@-!QNJ>=4 \\ @LOJ@-!HLI>A@@!PA>IAM@!=>PEA=PFA@/U-!$

RRW/ . >! 2 =MPF!TZ-!T_T_-!) BKAM>BM! 7 A5=>IL@!L@@OA?! , \APOILKA! . M?AM!T_4W_-!MAbOLML>Q! =66!L>?LKL?O=6@!] FB!HGN!L>IB! : 6BML?=!HMB J !@I=IA@!] LIF!@OE@I=>IL=6!PB J J O>LIN!@XMA=?!IB!@AGH4L@BG=IA! L>! : 6BML?=!HBM!RU!?=N@!BM!IFA!?OM=ILB>!BH!IFALM!IMLX-!] FLPFAKAM!L@!@FBMIAM/!

 $RRS/ .>! 2 = MPF!TU-!T_T-!) BKAM>BM! 7 A5 => IL@!L@@OA?!, \APOILKA! . M?AM!T_4WZ-!?LMAPIL>Q! \\IFA!5I=IA!5OMQAB>!) A>AM=G!=>?!5I=IA! < A=GIF! . HHLPAM!IB!L@@OA!=!XOEGLP!FA=GIF!=?KL@BMN!OMQL>Q!IFA! \\XOEGLP!IB!=KBL?!=GG!@BPL=G!BM!MAPMA=ILB>=G!Q=IFAML>Q@!BH!R_!XABXGA!BH! J BMA/!, \AP/! . M?AM! 1 B/!T_4 \\WZ/^{UR}!$

 $RT_/ \quad .> != !\ 2 = MPF!T[-!T_T_-!\)\ BKAM>BM!\ 7\ A5 => IL@!L@@OA?!\ ,\ APOILKA!\ .\ M?AM!T_4Wm-!MAbOLM4$ $L>Q!= GG!L>?LKL?O= G@!IF=I!?MLKA!L> IB!: GBML?=!HMB\ J\ !@I=IA@!\]\ LIF!@OE@I=>IL=G!PB\ J\ J\ O>LIN!@XMA=?!IB!@AGH4$ $L@BG=IA!L> !: GBML?=!HBM!HBOMIAA> !?=N@!BM!IFA!?OM=ILB> !BH!IFALM!IMLX-!\]\ FLPFAKAM!L@!@FBMIAM/!$

RTR/ . >! 2 = MPF!Z_-!T_T_-!) BKAM>BM! 7 A5 => IL@!L@@OA?! , \APOILKA! . M?AM! 1 B/!T_4WS-!BM?AM4 L>Q! 2 L= J L47 = ?A! 'BO>IN-! ; MB] = M?! 'BO>IN-! "= G J! ; A=PF! 'BO>IN!=>?! 2 B>MBA! 'BO>IN!IB!MA@IMLPI!

 $RTa/ . > !\#XMLG!U-!T_T_-!\ 2\ L=\ J\ L!\ 7=?A!\ 2=NBM!\ '=MGB@!\)\ L\ J\ A>Ak!L@@OA?!\ ,\ J\ AMQA>PN!\ .\ M?AM!$ $RS4T_-!BM?AML>Q!IF=I!=GG!XAM@B>!BOI@L?A!IFALM!FB\ J\ A@!=MA!A>PBOM=QA?!IB!\]\ A=M!=!PGBIF!H=PL=G!PBKAML>Q!$ $PB>@L@IA>I!\]\ LIF!POMMA>I!\ '\ 7\ '\ !QOL?AGL>A@/!\ ,\ J\ AM/!\ .\ M?AM/!\ 1\ B/!RS4T_/Ua!$

!

 $RTm/ . >! \# XMLG!W-!T_T_-! \ 2 = NBM! \) \ L \ J \ A>Ak!A \setminus IA>?A?!IFA!@I=IA!BH!A \ J \ AMQA>PN!HBM! \ 2 \ L= \ J \ L4$ $7 = ?A! \ ' \ BO>IN/! \ , \ \backslash AP/! \ . \ M?AM! \ , \ \backslash IA>?L>Q! \ 7 \ APG=M=ILB>!BH!+BP=G! \ 5 \ I=IA!BH! \ , \ \ J \ AMQA>PN/^{Um}!$

6K) FF'@]I@JHG'=VJ@@'HX=H'+, 1#&7BC'^;FF'F;Z@F\'J=[=V@'_=;FGD'

oU_/!e, \F/!Tg/! '66&?><9D&) MAAM! 7 APG/!oZ_!e, \F/!Zg!ei\$FAMA!L@!>B!] =N!HBM!L J J LQM=ILB>!?AIA>ILB>!H=4

PLGLILA@!IB!PB J XGN!] LIF! '7 '!QOL?AGL>A@!B>!@BPL=G!?L@I=>PL>Q!=>?!bO=M=>IL>L>Q!O>GA@@!%A@XB>?A>I@!

MAGA=@A!?AI=L>A?!J A>!=>?!] B J A>!B>!=!G=MQA!@P=GA/jg/!

!

RTS/ \$FA!PB>PGO@L

bOA>PA@!IF=I!=! ' . 8&74RS!BOIEMA=

 $IFA!X = \emptyset I!PBOX \\ GA!NA = M\emptyset - ^{am}!L > !=??LILB > !IB!BOIEMA = Y\emptyset !L > !BIFAM!XML \\ \emptyset B > \emptyset !=>?!^{-}LG\emptyset / ^{a} \\ [!]$

 $RZm/ 1 = ILB > = 66N! = ??!L > IAM > = ILB > = 66N-!QBKAM > JA > I@! = ??!^=LG! = ??!XML@B > !@I = HH!F = KA! = 6MA = ?N!$ $MAPBQ > LkA?!IFA!IFMA = I!XB@A?!EN! ' . 8 \& 7 4RS! = ??!MAGA = @A?!?AI = L > A?!L > ?LKL?O = G@/!&M = > -a^W! , IFLBXL = -a^S!$ $= > ?!$A \setminus = @^m - ! = > ?!F = KA! = 66!EAQO > !IB!MAGA = @A!XABXGA!IB! JLILQ = IA!IFA!F = MJ!IF = I!IFA!LJXA > ?L > Q!@XMA = ?!$ $BH! ' . 8 \& 7 4RS! \ 1 LGG!P = O@A/!$

!

 $RZ[/ ... > A!BH!IFA!G=MQA@I!XBGLPA!HBMPA@!L>!IFA!>=ILB>-!IFA!\ 2\ L=\ J\ L47=?A!"BGLPA!\ 7\ AX=MI\ J\ A>I-!MI\ A>I-MI\ A>I-MI\$

 $\label{eq:marginal_problem} $$MA?OPILB>!L>!=MMA@I@!=>?!EBBYL>Q@!BH!m_v/^mT!$$

RZW/ .>!#XMLG![-!T_T_-!=!IA J XBM=MN!MA@IM=L>L>Q!BM?AM!] =@!L@@OA?!HMB J !IFL@! 'BOMI!MAbOLM4 L>Q! 2 L= J L47=?A! 'BMMAPILB>@!IB!L J XGA J A>I!FA=GIF!@=HAIN!XMBIBPBG@!L>!IFA! 2 AIMB! 6 A@I!7 AIA>ILB>! 'A>IAM/!! . M?AM-! 'V?8: &LE&JI:89;-!T_4PK4TRUa[4(26!e5/7/!:G=/!#XM/![-!T_T_g!ePBXN!=I!#XX\!&-!, \F/! 2-!=I!TUT4U[g/!

 $RZS/ \qquad \$FA!: A?AM=G!: OMA=O!BH! "ML@B>@!F=@!L>@IMOPIA?!XML@B>!?LMAPIBM@!IB!XMLBMLILkA!MAGA=@4\\ L>Q!HA?AM=G!L> J=IA@!IB!FB J A!PB>HL>A J A>I-!I=YL>Q!L>IB!PB>@L?AM=ILB>!H=PIBM@!L>PGO?L>Q!isItFA!=QA!\\ =>?!KOG>AM=ELGLIN!BH!IFA!L> J=IA!IB! ' . 8 & 7 4RS-!L>!=PPBM?=>PA!] LIF!IFA!s ' 7 ' t!QOL?AGL>A@/j mZ!$

+K \$X@'+@>H@J'YAJ'&;G@=G@'+A>HJAF'=><'HX@'<@H@>H;A>'GH=><=J<G';>YAJW'#+%`G'<:H;@G'HA' I@AIF@'=H'RJAW@D'2F=<@GD'=><'6\$+K'''

 $RUR/ \quad 5APILB>!U/Ze\&\&geR_g!MAbOLMA@!IF=I!i 'A>IAM@!HBM!7L@A=@A! 'B>IMBG!=>?!"MAKA>ILB>!$ e' 7 'g!QOL?AGL>A@!HBM!IFA!XMAKA>ILB>!=>?!PB>IMBG!BH!L>HAPILBO@!=>?!PB J J O>LP=EGA!?L@A=@A@!@F=GG! $EA!HBGGB] A?/j!\&' , !" ; 1 75!e\#XX \ !\&-! , \ F/! 1-!=I!TUW4S [-!TaZg/^mU!]$

 $[\]begin{tabular}{l} $^{mT}! \cdot V9\&4;9V?;B\&): K?76&\&.6<7\&+9<878L6\&S9;\&*9;9:?L8;I<D\&O<\&*?>><&S9;\&''6>6?<6&-;9V-!6+%1!e#XM/!T-!T_T_g-!]]]/]$ M/BMQfXB@IfI] B4EMB] = M?4L> J = IA@4IA@I4XB@LILKA4PBMB>=KLMO@4P=GG@4MAGA=@A4QMB]|@IMA=Jf_l&.XL>LB>C!4;9V?;B&*9I:7P&J?8>Y&O&*#()I=Z[&78K6&N9KN-!5O>!5A>IL>AG/PBJfBXL>LB>fPBJJA>I=MNfHG4BX4PBJ4HL>YAG@IAL>4EMB]=M?4PBO>IN4^=LG4IFMA=I4PBMB>=KLMO@4PBKL?4T_T_U_Z4YE[Qak]BL>HTXHGO]U?@\G?=[N4@IBMN/FIJG/!$

 $^{^{\}rm mU}!:OGG!PBXN!=K=LG=EGA!=IC!FIIX@Cff\]\]\]$ /LPA/QBKf?BPGLEf?AIA>ILB>4@I=>?4 =M?@fT_RRfXE>?@T_RRMT_Rm/X?H/!

 $RUT/) \texttt{G}=?A@!L@!@OE^API!IB!\&', `@! 1 = ILB>= \texttt{G}! 7 \text{ AIA} > ILB>!5I=>?=M?@!e 1 7 5g/!!e \# XX \/ !\&-!, \ F/! \\ (-!=I!Rma/g!\$FA!POMMA>I!QBKAM>L>Q!KAM@LB>!BH!IFA! 1 7 5!L@!IFA!T_RS! 1 = ILB>= \texttt{G}! 7 \text{ AIA} > ILB>!5I=>?=M?@! \\ \text{HBM! 1 B>47 A ?LP=IA ?!:=PLGLILA@/ma!}$

RUZ/ 9>?AM!@APILB>!R/Re&g!BH!IFA! 1 7 5-!PBKAMA?!iH=PLGLIsLA@t!] LGG!BXAM=IA!L>!=PPBM?=>PA!

] LIF!=GG!=XXGLP=EGA!MAQOG=ILB>@!=>?!PB?A@-!@OPF!=@!IFB@A!BH!/!/!/!IFA! 'A>IAM@!HBM!7L@A=@A! 'B>IMBG!

=>?!"MAKA>ILB>!e' 7 'g/j!&',!1 7 5!e#XX\!&-!, \F/!..-!=I!Z_Ug/mm!

RUU/ \$FA!' 7'!F=@!L@@OA?!=>!&>IAML J!) OL?=>PA!B>! 2 =>=QA J A>I!BH!'BMB>=KLMO@!7L@4

A=@A!T_RS!e'. 8&74RSg!L>!'BMMAPILB>=G!=>?!7AIA>ILB>!:=PLGLILA@/!e#XX\/!&-!,\F/!:-!=I!UW4[Zg/!\$FL@!

QOL?=>PA!@IMA@@A@!IFA!KLI=G!L J XBMI=>PA!BH!A>@OML>Q!@BPL=G!?L@I=>PL>Q-!XMBXAM!FNQLA>A-!=PPA@@!IB!

IA@IL>Q-!8:B8L8B1?>!L@BG=ILB>!BH!XABXGA!] FB!F=KA!IFA!KLMO@-!=>?!bO=M=>IL>A!BH!XABXGA!A\XB@A?!IB!

IFA!KLMO@/!\$FA!QOL?=>PA!@XAPLHLP=GGN!@I=IA@!IF=I!LI!L@!L>IA>?A?!HBM!&',-!=@!=!G=]!A>HBMPA J A>I!

=QA>PN!] LIF!PO@IB?L=G!=OIFBMLIN!BH!?AI=L>A?!XBXOG=ILB>@/!

RUa/ \$FA! ' 7 '!) OL?=>PA!MAbOLMA@!IF=I!i ?AI=L>A?!XAM@B>@!] FB!=MA!PGB@A!PB>I=PI@!BH!=!

PB>HLM J A?!BM!@O@XAPIA?! ' . 8 & 7 4RS!P=@A!e] FAIFAM!IFA!P=@A!L@!=>BIFAM!L>P=MPAM=IA?f?AI=L>A?!XAM4

@B>-!@I=HH! J A J EAM-!BM!KL@LIBMg!@FBOG?!EA!XG=PA?!O>?AM!bO=M=>IL>A!HBM!RU!?=N@/j!e#XX\/!&-!, \F/!:-!

=I!mm/g!!!

RUm/ #>!L>?LKL?O=G!L@!PB>@L?AMA?!=!PGB@A!PB>I=PI!LH!IFAN!F=KA!EAA>!] LIFL>!=XXMB\L4

J =IAGN!m!HAAI!BH!=!' . 8 & 7 4RS!P=@A!HBM!=!XMBGB>QA?!XAMLB?!BH!IL J A-!BM!F=KA!F=?!?LMAPI!PB>I=PI!] LIF!

ma!5OXAM@A@@LB>!>BIA?!=IC!]]]/LPA/QBKf?AIA>ILB>4@I=>?=M?@fT /!

mm!: OGG!PBXN!=K=LG=EGA!=IC!]]] /LPA/QBKf?BPGLEf?AIA>ILB>4@I=>?=M?@fT RSf>?@T RS/X?H/!

!

 $P = @A@!L > ?LKL ?O = GGN/j ! e \# XX \\ / !\&-! , \\ F/! : -! = I!mmg ! eA J XF = @L@! = ??A?g/! 'BFBMI!bO = M = > IL > A!iL490 . 2 (I)0 . 2 (!mmg)] T J = A!iL490 . 2 (I)0 . 2 (!mmg)] T J = A!iL490 . 2 (I)0 . 2 (!mmg)] T J = A!iL490 . 2 (I)0 . 2 (!mmg)] T J = A!iL490 . 2 (I)0 . 2 (!mmg)] T J = A!iL490 . 2 (I)0 . 2 (!mmg)] T J = A!iL490 . 2 (I)0 . 2 (!mmg)] T J = A!iL490 . 2 (I)0 . 2 (!mmg)] T J = A!iL490 . 2 (I)0 . 2 (!mmg)] T J = A!iL490 . 2 (I)0 . 2 (!mmg)] T J = A!iL490 . 2 (I)0 . 2 (!mmg)] T J = A!iL490 . 2 (I)0 . 2 (!mmg)] T J = A!iL490 . 2 (I)0 . 2 (!mmg)] T J = A!iL490 . 2 (I)0 . 2 (!mmg)] T J = A!iL490 . 2 (I)0 . 2 (!mmg)] T J = A!iL490 . 2 (I)0 . 2 (!mmg)] T J = A!iL490 . 2 (I)0 . 2 (!mmg)] T J = A!iL490 . 2 (I)0 . 2 (!mmg)] T J = A!iL490 . 2$

 $Raa/ < B] AKAM-!IFA!>AA?!IB! i sMtA@IMLPI!bO=M=>IL>A?!L>?LKL?O=G@!HMB J !GA=KL>Q!IFA!H=PLGLIN! \\ eL>PGO?L>Q!IM=>@HAM@!IB!BIFAM!H=PLGLILA@gj !L@!@OE^API!IB!=>!A \ PAXILB>!HBM!?AI=L>A?!L>?LKL?O=G@!iMA4 \\ GA=@A?!HMB J !PO@IB?N/j!e#XX\/!&-!, \F/!:-!=I!mWg!$

!

 $Ram/ %AGA=@A!IB!L>?LKL?O=GLkA?!bO=M=>IL>L>Q!=>?!L@BG=ILB>!BOI@L?A!BH!=!?AIA>ILB>!H=PLGLIN!\\ @AMKA@!XOEGLP!FA=GIF!EAP=O@A-!=@!IFA! ' 7 ' !A\XG=L>@-!isLt>P=MPAM=IA?f?AI=L>A?!XAM@B>@!GLKA-!] BMY-!$

!
&\(+A>H;>:\(\end{array} = \end{array} =

1

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RmT/ &', `@!Y>B] L>Q!=>?!=HHLM J =ILKA!PB>?OPI!L>!H=LGL>Q!IB!=??MA@@!IFA!PGA=M!HBMA@AA=ELG4
LIN!BH!@AKAMA!BOIEMA=Y@!=I! (MB J A-!; \$'-!=>?!) G=?A@-!=>?!IB!I=YA!IFA!=PILB>!BH!MAGA=@L>Q!"AILILB>4
AM@-!?A J B>@IM=IA@!=!?L@MAQ=M?!HBM!IFA!MLQFI@-!] AGG4EAL>Q-!=>?!IFA!FO J =>LIN!BH!?AI=L>A?!L J J L4
QM=>I@/!\$FA!PB>IL>OA?!?AIA>ILB>!BH!"AILILB>AM@!=>?!BIFAM!?AI=L>A?!L>?LKL?O=G@!=I! (MB J A-!) G=?A@-!
=>?!; \$'!L@!MAPYGA@@/!

RmZ/ 7 A@XLIA!IFA!QGBE=G!X=>?A J LP!=>?!@FAGIAM4L>4XG=PA!BM?AM@!=PMB@@!IFA!PBO>IMN!=>?!

Y>B] L>Q!IFA!ML@Y@-!&', !=HHLM J =ILKAGN!PB>IL>OA@!IB!EML>Q!:6V!XABXGA!L>IB!?AIA>ILB>!PA>IAM@!=>?!IB!

IM=>@HAM!XMAKLBO@GN!?AI=L>A?!XABXGA!EAI] AA>!H=PLGLILA@/m[!&',!PB>IL>OA@!IB!L@@OA!?AI=L>AM!MAbOA@I@!

IB!PBO>ILA@!L>@IMOPIL>Q!^=LG!BHHLPL=G@!IB!FBG?!XABXGA!HBM!IFA J !X=@I!IFA!XBL>I!BH!PML J L>=G!PO@IB?N!

PB J L>Q!IB!=>!A>?/!&', !IFA>!IM=>@XBMI@!IFA@A! J A>!=>?!] B J A>!HMB J !IFA!GBP=G!^=LG!IB!L J J LQM=ILB>!

?AIA>ILB>!=I! (MB J A-!) G=?A@-!=>?!; \$ '/!!!

!

 $O@A?!9: >P\&?<\&?>?<7\&;6<9;7\&\&&',-!FB] AKAM-!L@!O@L>Q!PBFBMIL>Q!=@!IFA!XG=>>A? q=>?!XML J=MN q MA4 \\ @XB>@A!IB!=!Y>B]>!' . 8\&74RS!A\XB@OMA-!>BI!=!XM=PILPA!BH!G=@I!MA@BMI/!e#XX\/!&-!, \F/!&-!=I!RTZ! \\ oR_g/!$

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 $RmS/ 2 BMABKAM-!PBFBMIA?!QMBOX@!=MA!PB>HL>A?!L>!@X=PA@!IF=I!XMAKA>I!IFA J !HMB J !XM=PILP4 \\ L>Q!@BPL=G!?L@I=>PL>Q/! 'BFBMIA?!QMBOX@!=MA!>BI!XMBKL?A?!] LIF! J =@Y@!IB!XMAKA>I!IFA!IM=>@ J L@@LB>! \\ BH! '. 8 & 7 4RS-!=@!MAbOLMA?!EN!IFA! '7 '!XMBIBPBG@/!e#XX\/!&-!, \F/!:-!=I!m[g/!] \\$

 $R \ [_/ \&' , !F=@!>B!XG=>@!IB!XG=PA!@O@XAPIA?! ' . 8\&74RS!P=@A@!L>!L>?LKL?O=G! J A?LP=G!L@BG=4 \\ ILB>!L>!] FLPF! i sAt=PF!L@BG=IA?!L>?LKL?O=G!@FBOG?!EA!=@@LQ>A?!IFALM!B] >!FBO@L>Q!@X=PA!=>?!E=IF4 \\ MBB J - j !=@!IFA! ' 7 ' !L>@IMOPI@/!e#XX\/!&-! , \F/! : -!=I!mTg! 2 BMABKAM-!XABXGA!] FB!A\FLELI!HGO4GLYA! \\ @N J XIB J @!=MA!>BI!=G] =N@!MA J BKA?!HMB J !IFA!QA>AM=G!XBXOG=ILB>!EOI!L>@IA=?!=MA!@GAAXL>Q!=>?!A=I4 \\ L>Q!] LIFL>!HAAI!BH!BIFAM@/!$

P=660!I] LPA!=!?=N-!=@!IFA!?AIA>ILB>!@I=>?=M?@!MAbOLMA-!LI!I=YA@!I] B!IB!ALQFI!?=N@!IB!IML=QA!=!@LPY!

P=66/!e#XX\!&-!, \F/! (-!Ra_/g! 6 FA>! J A?LP=6!L@@OA@!=MA!=??MA@@A?-!L>?LKL?O=6@!MAXBMI!>BI!EAL>Q!

XMBXAM6N!IMA=IA?!BM!>BI!IMA=IA?!=I!=66/!e#XX\!&-!, \F/! (-!Ra_/g!"MBKL>Q!LEOXMBHA>!L@!PB J J B>6N!O@A?!

=@!=!E6=>YAI!@B6OILB>!IB!=>N!=>?!=66! J A?LP=6!L@@OA@/!e#XX\!&-!, \F/! (-!Ra_/g!

RWT/ !; AP=O@A! (MB J A!H=LG@!IB! J AAI!?AI=L>A?!L>?LKL?O=G`@! J A?LP=G!>AA?@!O>?AM!>BM J =G!

PLMPO J @I=>PA@-!IFA! J A?LP=G!@I=HH!=MA!LGG4XMAX=MA?!IB!XMBKL?A!=?AbO=IA! J A?LP=G!IMA=I J A>I!= J L?@I!

IFA! ' . 8 & 7 4RS!X=>?A J LP/!

RWZ/ (MB J A!F=@!=!G=MQA!XBXOG=ILB>!=>?!L@!BHIA>!BKAMPMB] ?A?/!e#XX\!&-!, \F/!:-!=I!RUS4

a_g!eBKAMPMB] ?L>Q!=I! (MB J Ag/!&', !P=>!ILQFIGN!?AI=L>!OX!IB!R-___!L>?LKL?O=G@!L>!IFA!H=PLGLIN/!

e#XX\!&-!, \F/! (-!TZ_!eA>?>BIA!RRWg/g! 6 FA>!IFA!XBXOG=ILB>!MA=PFA@!IF=I!>O J EAM-!LI!EAPB J A@!?=>4

QAMBO@GN!BKAMPMB] ?A?!] LIF!R__!BM! J BMA!XABXGA!L>!=!XB?!] LIF!ma!EA?@/!\$B!FBO@A!IFA@A!>O J EAM@-!

(MB J A!@OXXGLA@!@I=PY=EGA!EA?@!XG=PA?!EAI] AA>!EO>YEA?@-!L>!HMB>I!BH!IFA!@FB] AM@!=>?!E=IFMBB J @-!

>A\I!IB!IFA!XFB>A@-!=>?!L>!IFA!PB J J B>!IAGAKL@LB>!=MA=/!e#XX\!&-!, \F/! (-!RUS/g!#I!GA=@I!B>A!XB?-!

] LIF!RT_!?AI=L>AA@-!L@!POMMA>IGN!L>!@OPF!=!PMB] ?A?!@I=IA/!

 $RWU/ \quad . \ KAMPMB \] \ ?L>Q!=I! \ (\ MB \ J \ A!F=@!GA?!IB! \ J=>N!@=>LI=ILB>!=>?!FA=GIF!L@@OA@/!e\#XX \setminus !\&-! \ , \ \ /F/! \ (-!Ra_/g!\&I!EAPB \ J \ A@!L \ J \ XB@@LEGA!IB!=KBL?!FO \ J=>!PB>I=PI!=>?!IFA!O>LI!L@!F=M?AM!IB!YAAX!PGA=>/! \ e\#XX \setminus !\&-! \ , \ \ /F/! \ (-!Ra_g!$

RWa/!

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!
                   RSR/
                                      7 A@XLIA!IFA! ' . 8 & 7 4RS!IFMA=I-!% A@XB>?A>I@!PB>IL>OA!IB!?AI=L>!>A]!XABXGA!=I!
 ( MB J A/! '66& # MM=Y! 7 AP/!o!T[!e # XX \ !&&-!, \F/! . -!=I!WU4S_g!
                                      5B J A!?AI=L>A?!L>?LKL?O=G@! ] FB!MAbOLMA!=??LILB>=G!
                   RST/
P=MA!=MA!FBO@A?!L>!IFA! ( MBJA!; AF=KLBM=G! < A=GIF! 9 > LI!ei; < 9 ig-! ] FLPF!L@!@XGLI!L>IB!I ] B!@APILB>@/!
 . >A!O>LI!P=>!FBO@A!TT!XABXGA-! ] FLGA!IFA!BIFAM!P=>!FBO@A!ALQFI!XABXGA/.
                                                !&>?LKL?O=6@!L>!IFA!; < 9!INXLP=66N!@F=MA!=!MBB J! | LIF!=>BIFAM!XAM@B>-!=>?!@GAAX!
GA@@!IF=>!@L\!HAAI!=X=MI/!!'66&
                                                                       $ | B!?AI=L>A?!L>?LKL?O=G@!L>!IFA!; < 9!?B!>BI!POMMA>IGN!@F=MA!=!MBB J!
 ] FLGA!@GAAXL>Q-!EOI!=MA!L>!PGB@A!PB>I=PI!] LIF!BIFAN@!L>!IFA!O>LI!] FA>!L>!PBJJO>=G!=MA=@/!'66N
                                      7 \text{ AI=L>A?!L>?LKL?O=G@!L>!}; < 9 \text{!=MA!MAbOLMA?!IB!QB!IB!IFA!MAPMA=ILB>!N=M?!I]LPA!=!?=N!
                   RSZ/
HBM!=>!FBOM-!?A@XLIA!PB J XG=L>I@!IF=I!IFA!=MA=!L@!IBB!@ J =GG!IB!=GGB 1 !@BPL=G!?L@I=>PL>O/! '664
                                                                                                                                                                                                                                                 !
                                                                                 !$FA!QO=M?@!IFMA=IA>!IFA J ! ] LIF!EAL>Q!@A>I!IB!IFA!iFBGA-j!BM!5AQ4
MAQ=IA?!<B0@L>Q!9>LI-!0>GA@@!IFAN!QB!IB!MAPMA=ILB>/.
5B\ J\ A!?AI=L>A?!L>?LKL?O=G@!HAAG!IFAN!>AA?!IB!QB!L>IB!?L@PLXGL>=MN!FBO@L>Q!BM!MA\ J=L>!L@BG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!L>!LOBG=IA?!LOBG=IA?!L>!LOBG=IA?!LOBG=IA?!L>!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LOBG=IA?!LO
IFALM!MBB J @!IB!XMAKA>I!IFA!ML@Y!BH!L>HAPILB>-!EOI!=MA!PB>PAM>A?!IFALM! J A>I=G!FA=GIF!PB>?LILB>@-!L>4
PGO?L>O!XB@I4IM=O J =ILP!@IMA@@!?L@BM?AM!=>?! J =^BM!?AXMA@@LKA!?L@BM?AM-! 1 LGG! 1 BM@A>/!
                                       2 A=G@!L>!IFA!; < 9 !=NA!@AMKA?!L>!IFA!?=NNBB J !IB!=GG!?AI=L>A?!L>?LKL?O=G@!=I!IFA!
@= J A!IL J A-!EOI!IFAMA!=MA!B>GN!I ] B!I=EGA@!=>?!HA ] !PF=LM@-!=>?!@B J A!F=KA!IB!@LI!B>!IFA!HGBBM!IB!A=I/!
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!\$FA!I=EGA@!=>?!I] B!XFB>A@!L>!IFA!?=NMBB J !IF=I!=GG!

?AI=L>A?!L>?LKL?O=G@!L>!; < 9!O@A!=MA!>BI!EAL>Q!PGA=>A?/!

!\$FAN!B>GN!F=KA!IBLGAI!X=XAM!=K=LG=EGA!IB!PGA=>!IFA!I=EGA@!L>!IFA!PB J J B>!=MA=-!=>?!B>A! J =>!

MAXBMI@!O@L>Q!IBLGAI!X=XAM!IB!PGA=>!FL@!MBB J /! '660

! (MB J A!@I=HH!EML>Q!HBB?!L>!=!P=MI!IB!IFA!O>LI!HBM!=GG!

J A=G@-!EOI!?B!>BI!] A=M! J =@Y@!BM!QGBKA@!?A@XLIA!MAbOA@I@!HMB J !IFA!?AI=L>A?!XBXOG=ILB>!IB!?B!@B/!

!\$FA!QO=M?@!G=OQF!=I!IFA@A!MAbOA@I@/!

 $RSa/ 7AI=L>A?!L>?LKL?O=G@!=MA!MAbOA@IL>Q!H=PA! J=@Y@-!EOI!@I=HH!F=KA!>BI!XMBKL?A?!IFA J! =>?!F=KA!@=L?!IFAN!=MA!>BI!>APA@@=MN!HBM!?AI=L>AA@!BM!=MA!B>GN!HBM!BHHLPAM@/! '66& 6 =M@=>A! 7AP/!o!Ta! e#XX\!&&-!, \F/!y-!=I!SW4R_ag1!<=@=>!7AP/!o!RS4T_!e#XX\!&&-!, \F/!%-!=I!R_m4RTg1!#MM=Y!7AP/!o!Ra-! TR!e#XX\!&&-!, \F/!.-!=I!SR4S[g/!!$

RSm/ 5B=X!F=@!>BI!EAA>!MA=?LGN!=K=LG=EGA-!=>?!@B J A!L>?LKL?O=G@!F=KA!>BI!EAA>!=EGA!IB!

@FB] AM!O>GA@@!IFAN!F=?!HO>?@!IB!XOMPF=@A!@B=X!HMB J !PB J J L@@=MN/! 6 =M@=>A! 7 AP/!o!R [!e#XX\!&&-!
, \F/! y -!=I!SW4R_ag1! <=@=>! 7 AP/!o!RR-!RZ!e#XX\!&&-!, \F/!%-!=I!R_m4RTg1!#MM=Y! 7 AP/!o!W-!TZ!e#XX\!
&&-!, \F/! . -!=I!WU4S_g1! :=M=F! 7 AP/!o!T_!e#XX\!&&-!, \F/!"-!=I!SR4S [g/!, KA>!] FA>!XOMPF=@A?-!?A4

I=L>A?!L>?LKL?O=G@!=MA!>BI!EAL>Q!QLKA>!IFA@A!LIA J @!HBM!@AKAM=G!?=N@!=>?!=MA!MO>>L>Q!BOI!BH!A@@A>4

IL=G@!GLYA!@B=X!=>?!@F= J XBB/! 6 =M@=>A! 7 AP/!o!RW!e#XX\!&&-!, \F/! y -!=I!SW4R_ag1! <=@=>! 7 AP/!o!RR!

e#XX\!&&-!, \F/!%-!=I!R_m4RTg1! :=M=F! 7 AP/!o!T_!e#XX\!&&-!, \F/!"-!=I!SR4S [g/! <=>?!@=>LILkAM!=XXA=M@!

IB!EA!B>GN!=K=LG=EGA!IB!>OM@A@-!] FB!@B J AIL J A@!@XM=N!@=>LILKAM!B>!?AI=L>A?!L>?LKL?O=G@`!F=>?@!

] FA>!IFAN!=MA!MAPALKL>Q! J A?LP=ILB>/! '660

!

RS[/ &>?LKL?O=G@!I=YL>Q!XMA@PMLXILB>! J A?LP=ILB>!@AA!>OM@A@!I] LPA!=!?=N-!L>!IFA! J BM>L>Q!

=>?!AKA>L>Q/

! 1 OM@A@!=MA!>BI!PB>@L@IA>IGN!] A=M4

L>Q!QGBKA@!BM! J =@Y@!] FA>!?L@XA>@L>Q! J A?LP=ILB>!BM!PFAPYL>Q!LH!IFA!XAM@B>!F=@!@] =GGB] A?!IFA!

J A?LP=ILB>/

/!) O=M?@!X=I!?B] >!?AI=L>A?!L>?LKL?4

O=G@!@AKAM=G!IL J A@!=!?=N!=>?!?B!@F=YA?B] >@!BH!EA?MBB J @!IFMAA!IL J A@!XAM!?=N-!EOI!?B!>BI!=G] =N@!

] A=M!QGBKA@!BM! J =@Y@/! 6 =M@=>A! 7 AP/!o!TS!e#XX\!&&-! , \F/! y-!=I!SW4R_agI!<=@=>!7 AP/!o!TZ-!TU!

e#XX\!&&-! , \F/!%-!=I!R_m4RTgI!#MM=Y!7 AP/!o!RW!e#XX\!&&-! , \F/! . -!=I!WU4S_gI! :=M=F!7 AP/!o!RT4RU!

e#XX\!&&-! , \F/!"-!=I!SR4S [g/!#MBO>?!#XMLG!W-!HLKA!QO=M?@!] AMA!@A>I!FB J A!] FLGA!BIFAM@!=MA!] BMY4

L>Q!BKAMIL J A/! 6 =M@=>A! 7 AP/!o!ZZ!e#XX\!&&-! , \F/! y-!=I!SW4R_agI!<=@=>!7 AP/!o!TR-!TW!e#XX\!&&-!
, \F/!%-!=I!R m4RTgI! :=M=F!7 AP/!o!Rm!e#XX\!&&-! , \F/!"-!=I!SR4S [g/!

RSW/ \$FA!>O J EAM!BH!XABXGA!L>!=GG!BH!IFA!QA>AM=G!XBXOG=ILB>!O>LI@!L@!FLQF-!=>?!>A] !?A4

I=L>A?!L>?LKL?O=G@!F=KA!PB>IL>OA?!IB!PB J A!L>!BKAM!IFA!X=@I!HA]!] AAY@/! '66&7=M] N>!7 AP/!o!me^g!

e#XX\!&&-!,\F/!,-!=I!Z_4ZUgl!\$BGA>IL>B!7 AP/!o!m-!RR!e#XX\!&&-!,\F/!5-!=I!RRZ4R[gl!\$AXAI=IA4 2 = M4

IL>Ak!7 AP/!=I!o!Ra!e#XX\!&&-!,\F/!\$-!=I!RRW4TZgl&) = NGA!7 AP/!=I!o!RR!e#XX\!&&-!,\F/!;-!=I!R_4RU!gl!

#ML=@4 2 =MIL>Ak!7 AP/!=I!o!R_!e#XX\!&&-!,\F/!'-!=I!Ra4TRgl!(F=>!7 AP/!=I!o!WeYg!e#XX\!&&-!,\F/!+-!=I!

mW4[Ug/!"AILILB>AM!#X=MLPLB!F=@!@AA>!=EBOI!Ra!>A]!?AI=L>A?!L>?LKL?O=G@!L>!FL@!O>LI!L>!IFA!G=@I!I] B!

1 AAY@/!'66&#X=MLPLB!7 AP/!o![!e#XX\!&&-!,\F/!:-!=I!Za4ZSg/!!

RSS/ #@!MAPA>IGN!=@!#XMLG!U-!T_T_-!>A]!?AI=L>A?!L>?LKL?O=G@!F=KA!EAA>!IM=>@HAMMA?!IB!

(MB J A!=>?!] AMA!>BI!EAL>Q!IA@IA?!IB!?AIAM J L>A!] FAIFAM!IFAN!F=KA!'. 8 & 7 4RS/!'66&0=GGBF!7 AP/!o!

RZ!e#XX\!&&-!,\F/!7-!=I!TT4TSg1!"BMIOB>?B!7 AP/!=I!o!RZ!e#XX\!&&-!,\F/!#-!R4Sg/!!

!

T__/ #I!GA=@I!I] B!BH!IFA!?AI=L>A?!L>?LKL?O=G@!MAPA>IGN!IM=>@HAMMA?!IB! (MB J A!F=?!HAKAM@-!

B>A!BH!] FB J!] = @!KL@LEGN!@F=YL>Q!L>!IFA!?L>L>Q!MBB J/!; BIF!] AMA!AK

T_U/

 $T_{[/]} = 6 \text{ FA} > !?AI = L > A?!L > ?LKL?O = G@!IMN!IB! J = YA!IFALM!B] > !J = @Y@-!IFAN! = MA!IBG?!IFAN! = MA!>BI!$ $= GGB] A?!IB!PBKAM!IFALM!H = PA@/! '66 \% \#X = MLPLB! 7 AP/!o![!e \#XX \ !\&\&-!, \ F/!:-!=I!Za4ZSg1!, @PBE=M! 7 AP/!o!W!$ $= \#XX \setminus !\&\&-!, \ F/! < -!=I!U[4aRg/!!]$

T_W/ \$FAMA!L@!>B!F=>?!@=>LILkAM!=K=LG=EGA!L>!IFA!PB J J B>!=MA=/! '66!"BMIOB>?B!7 AP/!=I!o!

T_!e#XX\!&&-!, \F/!#-!R4Sg!!#GH=MB!) =MPL=!7 AP/!=I!o!RR!e#XX\!&&-!, \F/! (-!=I!mR4m[g]!\$AXAI=IA4 2 =M4

IL>Ak!7 AP/!=I!o!W!e#XX\!&&-!, \F/!\$-!=I!RRW4TZg]!7=M] N>!7 AP/!o!ae?g!e#XX\!&&-!, \F/!, -!=I!Z_4ZUg]!

'F=KAk!7 AP/!=I!o!Rm!e#XX\!&&-!, \F/!) -!=I!U_4Umg/!7 AI=L>A?!L>?LKL?O=G@!F=KA!MAXBMIA?!@AAL>Q!IFA!

QO=M?@!] LIF!F=>?!@=>LILkAM!EOI!?AI=L>A?!L>?LKL?O=G@!=MA!>BI!=GGB] A?!IB!O@A!LI/& '66!"BMIOB>?B!7 AP/!

=I!o!T_!e#XX\!&&-!, \F/!#-!R4Sg]! 'F=KAk!7 AP/!=I!o!Rm!e#XX\!&&-!, \F/!) -!=I!U_4Umg/!!

T_S/ \$FAMA!L@!F=>?!@=>LILkAM!L>!IFA!>OM@A`@!=MA=!] FAMA!?AI=L>A?! J A>!MAPALKA! J A?LP=4

ILB>/! '66& !<B] AKAM-!?AI=L>A?!L>?LKL?O=G@!=MA!

B>GN!=GGB] A?!B>A!@bOLMI!] FA>!MAPALKL>Q! J A?LP=ILB>/! '66!

!!

!

TR_/ 9>ILG!MAPA>IGN-! (MB J A!@I=HH!] AMA!>BI!] A=ML>Q! J =@Y@!BM!Q6BKA@/! '66!" BMIOB>?B!

7 AP/!=I!o!Ta!e#XX\!&&-!, \F/!#-!R4Sgl&#E?OG!O=66BF! 7 AP/!o!Ta!e#XX\!&&-!, \F/!7-!=I!TT4TS!gl!" AMAk!

+L J B>A@! 7 AP/!=I!o!RR!e#XX\!&&-!, \F/! 2 -!=I![a4[Wgl!'F=KAk! 7 AP/!=I!o!TR!e#XX\!&&-!, \F/!)-!=I!U_4

Umg/!5B J A!BHHLPAM@!@ILGC!H=LG!IB!] A=M!Q6BKA@!BM! J =@Y@/!'66! 6 =M@=>A! 7 AP/!o!TR-!TS!e#XX\!&&-!, \F/!

y-!=I!SW4R_agl!<=@=>!7 AP/!o!TZ-!TU!e#XX\!&&-!, \F/!%-!=I!R_m4RTgl!#MM=Y! 7 AP/!o!RWI!:=M=F! 7 AP/!o!

RT4RU!e#XX\!&&-!, \F/!"-!=I!SR4S[gl!"BMIOB>?B! 7 AP/!=I!o!Tm!e#XX\!&&-!, \F/!#-!R4Sgl!'F=KAk! 7 AP/!=I!

o!TT!e#XX\!&&-!, \F/!)-!=I!U_4Umg/!) O=M?@!=MA!@AA>!IBOPFL>Q!IFALM!H=PA@!=>?!IFA>!IFL>Q@!L>!IFA!

XB?@-!@OPF!=@!XABXGA-!HBB?!IM=N@!=>?!BIFAM!LIA J @!L>!IFA!GLKL>Q!=MA=-!=>?!IFAN!=MA!>BI!BE@AMKA?!

] =@FL>Q!IFALM!F=>?@!BHIA>/!'66&#E?OG!O=66BF! 7 AP/!o!Tm4TW!e#XX\!&&-!, \F/!7-!=I!TT4TSgl!#6H=MB!

) =MPL=! 7 AP/!=I!oo!R_4RR-!RU!e # XX \ !&&-! , \F/! (-!=I!mR4m [gl! \$ AXAI=IA4 2 =MIL>Ak! 7 AP/!=I!oo!RZ4RU! e # XX \ !&&-! , \F/! \$ -!=I!RRW4TZg1! 7 =M] N>! 7 AP/!o!meFg4eLg!e # XX \ !&&-! , \F/! , -!=I!Z_4ZUgl&" BMIOB>?B! 7 AP/! = I!o!T [!

TRU/ #@!BH!#XMLG![-!T_T_-!?AI=L>A?!L>?LKL?O=G@!F=KA!F=?!IFALM!\$ 8 @-!XFB>A@-!=>?!I=EGAI@!

PB>HL@P=IA?/! '66!"BMIOB>?B!7 AP/!=I!o!RS!e#XX\!&&-!, \F/!#-!R4Sg/! 1 B!O>LI!] LIFL>! (MB J A!L@!=GGB] A?!

IB!]=IPF!\$ 8 /& '66!"BMIOB>?B!7 AP/!=I!o!RS!e#XX\!&&-!, \F/!#-!R4Sg1!#GH=MB!) =MPL=!7 AP/!=I!o![!e#XX\!
&&-!, \F/!(-!=I!mR4m[g1!'66&7=M]N>!7 AP/!o!W!e#XX\!&&-!, \F/!, -!=I!Z 4ZUg/!

 $TRm/ .>! \# XMLG! [-!@B J A!?AI=L>A?!L>?LKL?O=G@!M=L@A?!PB>PAM>@!=EBOI!PB>?LILB>@!=>?!HA=M@!\\ BH! ' . 8 \& 7 4RS!=>?!QO=M?@!EAQ=>!EA=IL>Q!IFA J /! : GBMA@!%= J B@! 7 AP/!o!T_!e#XX\!&&-! , \F/! 9 -!=I!RTU4\\ Z_g/! .>A!XAM@B>!] = @!YLPYA?!L>!IFA!MLE@!=GIFBOQF!FA!] = @!>BI!= J B>Q!IFB@A! J = YL>Q!PB J XG=L>I@/!\\ : GBMA@!%= J B@! 7 AP/!o!T_!e#XX\!&&-! , \F/! 9 -!=I!RTU4Z_g/!$FA!QO=M?@!=MA!>BI!=GGB] L>Q!?AI=L>A?!XAB4\\ XGA!IB!PB>I=PI!IFALM!=IIBM>AN@-!] FLPF!IF=I! J =>!EAGLAKA@!L@!MAI=GL=ILB>!L>!MA@XB>@A!IB!IFA@A!PB J 4\\ XG=L>I@/! : GBMA@!%= J B@! 7 AP/!o!TR!e#XX\!&&-! , \F/! 9 -!=I!RTU4Z_g/!$

TR[/ 5L>PA!IFA!' . 8 & 7 4RS!BOIEMA=Y!=I! (MB J A-!IFAMA!F=@!EAA>!=!?APMA=@A!L>! J A?LP=G!

@I=HH/!'66

!\$FAMA!F=@!EAA>!>B!L>PMA=@A!L>!

@PMAA>L>Q@/&'660

!7 AI=L>A?!L>?LKL?O=G@!] FB!MAbOA@I!

AK=GO=ILB>!=>?!IB!@AA!=!?BPIBM!F=KA!F=?!IFALM!MAbOA@I@!?A>LA?/&'660

!

TRW/ 6 FA>!@B J AB>A!L@!@LPY!] LIF!PBG?!@N J XIB J @-!IFAN! J O@I!] =LI!HLKA!IB!ALQFI!?=N@!EA4

HBMA!IFAN!P=>!@AA!=!?BPIBW!'660

! 6 FA>!BIFAM!

?AI=L>A?!L>?LKL?O=G@!=MA!I=YA>!BOI!BH!IFA!XB?@!HBM!PBOQFL>Q!BM!L@@OA@!] LIF!EMA=IFL>Q-!IFA!BIFAM!?A4
I=L>A?!L>?LKL?O=G@!=MA!>BI!IBG?!] FAIFAM!IFAN!F=KA!EAA>!A\XB@A?!IB! ' . 8 & 7 4RS/! '66&!

!!

TRS/ #!?AI=L>A?! J =>!] =@!@LPY!] LIF!=!PBOQF!=>?!MAbOA@IA?!IB!@AA!=!?BPIBM-!EOI!] =@!IBG?!

IF=I!FA!] =@!>BI!=!XMLBMLIN/!'66&

!<A!] = @!>BI!

!

L@BG=IA?!HMB J !IFA!MA@I!BH!IFA!XB?/!)B ' 6 6 &

 $IB!IFA!PMB \] \ ?A?!H=PLGLIN!L>! \ 2 \ L= \ J \ L!F=?!IFA!@FAMLHH!`@!BHHLPA!O>A=@N!BKAM!IFA!XB@@LELGLIN!IF=I!IFA!\\ PBMB>=KLMO@!PBOG?!A=@LGN!EA!IM=>@ \ J \ LIIA?/j!e#XX\'!&-!, \ \ F/! \ y-!ZZm4UR/g!$

!

TTU/ .>!#XMLG!W-!T_T_-!IFA!#@@L@I=>I!: LAG?! . HHLPAM!+L=>=!0/! '=@I=>B!@I=IA?!L>!=!?APG=M=4

ILB>!IB!IFL@!PBOMI!IF=I! (MB J A!F=?!Z!P=@A@!BH!G=EBM=IBMN!PB>HLM J A?!XB@LILKA@!HBM! ' . 8 & 7 4RS!

= J B>Q@I!@I=HH!=>?!=!?AI=L>A?!L>?LKL?O=G-!=>?!IF=I!=I!GA=@I!TZW!?AI=L>A?!L>?LKL?O=G@!] AMA!A\XB@A?!

IB!=!PB>HLM J A?!P=@A!BH! ' . 8 & 7 4RS/!!e # XX\!&-!, \F/!&-!=I!RTZ4TTU!o!RT/g!\$FA@A!TZW!L>?LKL?O=G@!] FB!

F=KA!EAA>!A\XB@A?!IB!=!XAM@B>!PB>HLM J A?!IB!F=KA! ' . 8 & 7 4RS!=MA!EAL>Q!XG=PA?!L>!iPBFBMI@!] LIF!

MA@IMLPIA?! J BKA J A>I/j!e # XX\!&-!, \F/!&-!=I!RTZ!o!R_/g!

 $TTa/ $FA!?=N!EAHBMA-!L>KA@ILQ=IL>Q!HMB J !IFA! 2 L= J L! < AM=6?!] = @!MAGA=@A?!] FLPF!@OQQA@I@! IF=I!IFA!>O J EAM!BH!XABXGA!] LIF!IFA!KLMO@!L@!O>?AMMAXBMIA?!=>?!i!r>BI!PB J XGAIAGN!=PPOM=IA!=@!IA@I4 L>Q!L@!>BI!PB>?OPIA?!B>!@LIA!=>?!?AI=L>A?!L>?LKL?O=G@!=MA!@A>I!IB!=>!BHH4@LIA!FB@XLI=G!IB!EA!IA@IA?-`! j!=PPBM?L>Q!IB!=!HA?AM=G!BHHLPL=G!L>IAMKLA] A?!EN!IFA!<AM=G?/!!e #XX\!&-!, \F/!7-!=I!UR/g!!$

TTm/

: GBML?=-!L>PGO?L>Q!; MB] =M?!\$M=>@LILB>=G! 'A>IAM!=>?!) G=?A@! 'BO>IN!7AIA>ILB>! 'A>IAM-!P=>!EA!

=KBL?A?/j!!e#XX\!&-!, \F/!%-!=I!ZUT4UZ/g!\$FA@A! J A J EAM@!BH! 'B>QMA@@!A\XMA@@A?!IF=I!IFAN!] AMA!

i?AAXGN!?L@IOMEA?!EN!&', `@!PB>IL>OA?!=PILKLIN!IB!IM=>@HAM!=>?!?AI=L>!G=MQA!QMBOX@!BH!L J J LQM=>I@!

L>!IFA! J L?@I!BH!=!QGBE=G!X=>?A J LP-!A@XAPL=GGN!=I!=!H=PLGLIN!] FAMA!?AI=L>AA@!=>?!A J XGBNAA@!F=KA!

IA@IA?!XB@LILKA/j!e#XX\!&-!, \F/!%-!=I!ZUTg!!

!

!

TTW/ \$FA@A!HBOM! J A J EAM@!BH! 'B>QMA@@!=G@B!@I=IA?!IF=I!isLtI!L@!O>?L@XOIA?!IF=I!^=LG@-!XML@4
B>@-!=>?!?AIA>ILB>!PA>IAM@!=MA!FLQFGN!KOG>AM=EGA!IB! '. 8&74RSp!?OA!IB!IFA!H=PI!IF=I!isAtHHAPILKA!

@BPL=G!?L@I=>PL>Q!L@!=G J B@I!L J XB@@LEGA!=>?!>APA@@=MN!?L@L>HAPI=>I!L@!M=MAGN!=K=LG=EGA!IB!?AI=L>AA@-j!
=>?!A@XAPL=GGN!@B!QLKA>!IF=I!IFA!@LIO=ILB>!L>!i (MB J A!L@!X=MILPOG=MGN!=G=M J L>Q!L>!IFL@!MA@XAPIj!L>!

GLQFI!BH!MAXBMIA?!iBKAMPMB] ?A?!PB>?LILB>@!AKA>!XMLBM!IB!IFA!L J X=PI!BH! '. 8&74RS/j!e#XX\!&-!, \F/!

%-!=I!ZUT/g!!\$FAN!=G@B!=??A?!IF=I!iLI!=XXA=M@!IF=I! (MB J A!L@!>BI!=I!=GG!XMAX=MA?!IB! J LILQ=IA!A\XB4

@OMA!IB! '. 8&74RS-!BM!IB!=?AbO=IAGN!MA@XB>?!@FBOG?!=>!BOIEMA=Y!=I!IFA!H=PLGLIN!BPPOM/!\$FA@A!L@4

@OA@!=MA!B>GN!PB J XBO>?A?!EN!IFA!H=PI!IF=I! '. 8&74RS!F=@!>B] !MA=PFA?! (MB J A/j!e#XX\!&-!, \F/!

%-!=I!ZUT4UZg!

TTS/ !5I=HH!=I! (MB J A!=MMLKA!=>?!GA=KA!B>!=!@FLHI!E=@L@-!=>?!IFAMA!L@!GL J LIA?!=ELGLIN!IB!=?4

AbO=IAGN!@PMAA>!L>PB J L>Q!@I=HH!HBM!>A] -!=@N J XIB J =ILP!L>HAPILB>/!5I=HH!QA>AM=GGN!GLKA!L>!IFA!PB J 4

J O>LILA@!>A=M!IFA@A!H=PLGLILA@ \mathbf{q} =MA=@!] FAMA!IFAMA!=MA!PB>HLM J A?!P=@A@!BH! ' . 8&74RS/!!!

TZ_/ !\$FA!BOIEMA=Y!=I! (MB J A!F=@!=HHAPIA?!IFA!L J J LQM=ILB>!PBOMI!FBO@A?!=I!IFA!H=PLGLIN!

=>?!MO>!EN!IFA!, \APOILKA!. HHLPA!HBM!& J J LQM=ILB>!%AKLA]!ei, . &%jg/! (MB J A!& J J LQM=ILB>! ' BOMI!L@!

=PPA@@A?!IFMBOQF!IFA!@= J A!GBEEN!=@!IFA!?AIA>ILB>!PA>IAM/!OO?QA@-!PBOMI!@I=HH-!=>?!EBIF!QBKAM>4

J A>I!=>?!?AHA>@A!=IIBM>AN@!F=KA!A\XMA@@A?!PB>PAM>!=EBOI!IFALM!@=HAIN!=>?!FA=GIF/!!

! !

 $TZR/ .>! 2 = MPF!TT-!T_T-!IFA! 1 = ILB>= G! \#@@BPL=ILB>!BH!\& J J LQM=ILB>!00?QA@!ei 1 \#\&0jg-! \\ IFA!\&' ,!"MBHA@@LB>= G@! 9>LB>!ei\&' ,!9>LB>jg-!=>?!IFA! \# J AMLP=>!& J J LQM=ILB>!+=] NAM@! #@@BPL=4 \\ ILB>!ei #\&+ #jg-!] MBIA!=!^BL>I!@I=IA J A>I!?A J =>?L>Q!IF=I! , .&%!PGB@A!= GG!BH!IFA!L J J LQM=ILB>!PBOMI@! \\ >= ILB>] L?A-!=>?!@I=IL>O-!= J B>O!BIFAM!IFL>O@-!IF=IC!!$

 $\label{eq:special-sp$

e#XX\!&-!, \F/!5-!=I!ZUa4U[-!ZUmg!

 $TZT/ .>! 2 = MPF!Tm-!T_T-!IFA! 1 \#\&0-!IFA!\&' , !9>LB>-!\#\&+\#-!=>?!=! J OGILIO?A!BH!BIFAM!BM4 \\ Q=>Lk=ILB>@!] MBIA!=!GAIIAM!?LMAPIGN!IB!\#IIBM>AN!) A>AM=G! ; =MM!?A J =>?L>Q!IFA!PGB@OMA!BH!=GG!L J J L4 \\ QM=ILB>!PBOMI@!>=ILB>] L?A-!=>?!@I=IL>Q!IF=I!i?AI=L>A?!PBOMI@! J O@I!=G@B!EA!PGB@A?!IB!L>4XAM@B>! \\ FA=ML>Q@!L>!BM?AM!IB! J L>L J LkA!IFA!@XMA=?!BH!IFA!KLMO@-!@GB] !IFA!M=IA!BH!>A] !L>HAPILB>@-!=>?!IB! \\ =KBL?!BKAM] FAG J L>Q!GBP=G!MA@BOMPA@/j!!e#XX\!&-! , \F/!$-!=I!ZUW4aRg!!$

 $TZZ/ .>! 2 = MPF!Z_-!T_T_-!IFA! 1 \#\&0!L@@OA?!=>!=??LILB>=G!@I=IA J A>I/!!\$FA!@I=IA J A>I!EA4$ $QL>@!EN!bOBIL>Q!=!iPOMA>I!LJ J LQM=ILB>!^O?QA!] FB!L@!=!9/5/!J LGLI=MN!KAIAM=>i!@I=IL>QC!$

&!?B>dI!@=N!IFL@!GLQFIGN-!EOI! , . &% !F=@!?A J B>@IM=IA?!IF=I!IFAN!>AA?!IB!EA!QOIIA?!=>?!MAEOLGI!
HMB J !IFA!=@FA@/!!&dKA!>AKAM!] LI>A@@A?!=>!OIIAM!G=PY!BH!PB>PAM>!HBM!XABXGA!GLYA!&!F=KA!FAMA/!!
&>! J N!HBM J AM!GLHA-!] A!IMA=IA?!P=XIOMA?!\$=GLE=>!=>?!&5&5!] LIF! J BMA!FO J =>LIN/!! 2 BMABKAM-!
&dKA!>AKAM!@AA>!] BM@A!GA=?AM@FLX/!!#!PML@L@!O@O=GGN!EML>Q@!QBB?!=>?!E=?!IB!IFA!GLQFI/!! 6 A!
F=KA!>BIFL>Q!EOI!?=MY>A@@/!!

e#XX\!&-!, \F/!9-!=I!ZaT4am-!ZaTg!

 $TZS/ 2 => N!?AI=L>A?!L>?LKL?O=G@!F=KA!A \setminus XAMLA>PA?!@LQ>LHLP=>I!IOM>BKAM!BH!PAGG J=IA@-!$ $F=KL>Q!OX!IB!@L \setminus !BM!@AKA>!>A] !PAGG J=IA@!@L>PA!IFALM!?AIA>ILB>!L>!) G=?A@/&'66!7=LMB>!; =MMA?B!$ $5=> PFAk!7AP/!o!m!e\#XX \setminus !\&\&-!, \setminus F/!8-!=I!RZR4ZWgl!) AM=M?B!8=MQ=@!7AP/!o!m!e\#XX \setminus !\&\&-!, \setminus F/!*-!=I!$ $RaR4amgl!\$=FLJL!"AMAk!o!S!e\#XX \setminus !\&\&-!, \setminus F/!6-!=I!RZS4UUgl!:M=>YGL>!\%=JB>!) B>k=GAk!o!m!e\#XX \setminus !\&\&-!, \setminus F/!V-!=I!RUa4a_g/!$

TU_/ \$FAMA!=MA!=XXMB\L J =IAGN!Sa!?AI=L>A?!L>?LKL?O=G@!L>!=!XB?!=I!=!IL J A/! '66!7=LMB>!
; =MMA?B!5=>PFAk!7 AP/!o!R [!e#XX\!&&-!, \F/! 8 -!=I!RZR4ZWgI!: M=>PL@PB!%LKAMB! 8 =GAMB>!7 AP/!o! [!
e#XX\!&&-!, \F/!3-!=I!Ra [4mTg/!\$FA!XB?@!=MA!@B!PMB]?A?-!IF=I!@BPL=G!?L@I=>PL>Q!=I!=!@=HA!@L\!HAAI!
?L@I=>PA!L@!L J XB@@LEGA-!A@XAPL=GGN!] LIF!IFA!PB>@I=>I!L>HGO\!BH!?AI=L>A?!L>?LKL?O=G@/! '66!7=LMB>!
; =MMA?B!5=>PFAk!7 AP/!o!RT!e#XX\!&&-!, \F/!8-!=I!RZR4ZWgI!) AM=M?B!8=MQ=@!7 AP/!o!m-!W!e#XX\!&&-!
, \F/!*-!=I!RaR4amgl!&MKL>!2 A>?Bk=!5LGL@!7 AP/!o!m!e#XX\!&&-!, \F/!##-!=I!RmZ4m[gI!: M=>PL@PB!
%LKAMB!8=GAMB>!7 AP/!o![!e#XX\!&&-!, \F/!3-!=I!Ra[4mTgI!\$=FLJL!"AMAk!o!RZ!e#XX\!&&-!, \F/!6-!=I!
RZS4UUgI!: M=>YGL>!%=JB>!) B>k=GAk!o!RR!e#XX\!&&-!, \F/!V-!=I!RUa4a_g/!

TUR/ #66!?AI=L>A?!L>?LKL?O=G@!L>!=!XB?!=G@B!@F=MA!PB J J O>=G!E=IFMBB J @!=>?!@FB] AM@-!

] FLPF!?B!>BI!F=KA!@L\!HAAI!BH!?L@I=>PA!EAI] AA>!IFA J -! J =YL>Q!LI!L J XB@@LEGA!IB! J =L>I=L>!=!@=HA!@B4

PL=G!?L@I=>PA!AKA>!] FLGA!O@L>Q!IFA!MA@IMBB J !BM!E=IFL>Q/! '66!7=LMB>!; =MMA?B!5=>PFAk!7 AP/!o!RZ!

e#XX\!&&-!, \F/! 8 -!=I!RZR4ZWgl!) AM=M?B!8=MQ=@!7 AP/!o!m!e#XX\!&&-!, \F/!*-!=I!RaR4amgl!: M=>YGL>!

%= J B>!) B>k=GAk!o!m!e#XX\!&&-!, \F/!V-!=I!RUa4a g/!

TUT/ 9>6LYA!; \$ '!BM! (MB J A-!IFAMA!L@!>B!P=HAIAML=/!7 AI=L>A?!L>?LKL?O=6@!A=I!L>!IFA!PB J 4

J O>=G!@A=IL>Q!=MA=!L>!IFALM!XB?-!Y>B] >!=@!i@=IAGGLIA!HAA?L>Q/j!e#XX\!&-!, \F/! (-!=I!RmT/g!\$FA!I=4

EGA@!O@A?!HBM!A=IL>Q!=>?!?=LGN!GLKL>Q!O@O=GGN!@A=I!HBOM!XABXGA-!EOI!?OA!IB!BKAMPMB] ?L>Q-!IFAN!=MA!

>B] !@A=IL>Q!HLKA!IB!@L\!XABXGA!=I!=!IL J A/! '66!) AM=M?B!8=MQ=@!7 AP/!o![!e#XX\!&&-!, \F/!*-!=I!RaR4

amg/!#@!=!MA@OGI-!IFAMA!L@!B>GN!=EBOI!U_!IB!a_!PA>IL J AIAM@!BH!@AX=M=ILB>!EAI] AA>!?AI=L>A?!L>?LKL?O4 =G@!] FA>!IFAN!=MA!A=IL>Q!=I!IFA!I=EGA@/! '66!: M=>PL@PB!%LKAMB!8=GAMB>!7 AP/!o![!e#XX\!&&-!, \F/!3-!=I! Ra[4mTg/!

TUZ/ 1 A] !?AI=L>A?!L>?LKL?O=G@!=MMLKA!=I!) G=?A@!AKAMN!?=N-!@B J A!=GMA=?N!A\FLELIL>Q!HGO!

GLYA!@N J XIB J @!GLYA!PBOQFL>Q/! '66!

g/!\$FAMA!

L@!>B!L>?LP=ILB>!IF=I!>A] !?AI=L>A?!L>?LKL?O=G@!=MA!IA@IA?!HBM! ' . 8 & 7 4RS!BM!MBOIL>AGN!bO=M=>IL>A?!

EAHBMA!EAL>Q!XG=PA?!L>!IFA!XB?!] LIF!IFA!MA@I!BH!IFA!?AI=L>A?!L>?LKL?O=G@/&)B!e#XX\!&&-! , \F/! ; ;-!=I!

RmW4[Tgl!7=LMB>!;=MMA?B!5=>PFAk!7AP/!o!S!e#XX\!&&-! , \F/!8-!=I!RZR4ZWgl!:M=>PL@PB!%LKAMB!8=GA4

MB>!7AP/!o!RR!e#XX\!&&-! , \F/!3-!=I!Ra[4mTgl!\$=FL J L!"AMAk!7AP/!o!R_!e#XX\!&&-! , \F/! 6-!=I!RZS4

UUg/!

TUU/ &>!=6G!@L\!XB?@-!L>?LKL?O=G@!@F=MA! J =>N!PB J J B>!@X=PA@!=>?!IBOPF!IFA!@= J A!@OM4

H=PA@/!#GG!@L\!O>LI@!=>?!IFA!@AQMAQ=ILB>!O>LI!@F=MA!=!PB J J B>!G=] !GLEM=MN/!&>!A=PF!XB?-!IFAMA!=MA!

B>GN!HBOM!XFB>A@!=K=LG=EGA!XAM!XB?!IF=I!AKAMNB>A! J O@I!@F=MA-!=>?!XABXGA! J O@I!=G@B!@F=MA!I=EGAI@/!

5L J LG=MGN-!=GG!?AI=L>A?!L>?LKL?O=G@!L>!IFA!@AQMAQ=ILB>!O>LI!@F=MA!IFA!@= J A!I] B!XFB>A@/!

TUa/ \$FAMA!=MA!>B!@=>LILkL>Q!] LXA@!BM!PGA=>L>Q!@OXXGLA@!=K=LG=EGA!IB!] LXA!?B] >!IFA!

XFB>A@!L>!EAI] AA>!P=GG@-!IFAMAHBMA!IFA!?AI=L>A?!L>?LKL?O=G@!=MA!HBMPA?!IB!O@A!^O@I!=!] AI!X=XAM!

IB] AG!L>!=>!=IIA J XI!IB!PGA=>!IFA!XFB>A@!EAHBMA!=>?!=HIAM!O@A/! '66!: M=>PL@PB!%LKAMB! 8 =GAMB>! 7 AP/!

o!S!e#XX\!&&-!, \F/!3-!=I!Ra[4mTg/!

TUm/ 'B>IM=PIBM@!=>?!?AI=L>A?!L>?LKL?O=G@!F=KA!PB>IL>OBO@GN!MAXBMIA?!O>@=>LI=MN!XFN@L4
P=G!PB>?LILB>@-!G=PY!BH! J A?LP=G!P=MA-!=>?!XFN@LP=G! J L@IMA=I J A>I/!e#XX\!&-!, \F/! (-!=I!RmT/g!) G=?A@!
F=@!H=LGA?!IB!@OE@I=>ILKAGN!MA J A?N!IFA@A!XBBM!PB>?LILB>@/!!

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 $TU[/ 9>0=>LI=MN!E=IFMBB J 0!=MA!=!XAM0L0IA>I!XMBEGA J /!\$FA!^=LG!HBMEL?0!IFA!O@A!BH!EGA=PF!$ $HBM!PGA=>L>Q!IFA!E=IFMBB J 0/!e\#XX \setminus !\&-!, \setminus F/! (-!=I!RmT/g!5F=JXBB!L0!INXLP=GGN!O@A?!=0!=!0OE0ILIOIA!$ $HBM!0B=X/!e\#XX \setminus !\&-!, \setminus F/! (-!=I!RmT/g!\$FAMA!L0!JBG?!L>!IFA!E=IFMBB J 0/!e\#XX \setminus !\&-!, \setminus F/! (-!=I!RmT/gl!BH!\&>0XAPIBM!) A>/!%AXBMI!. &) 4RW4ZT-!>BIL>Q!G=PY!BH!$ PGA=>GL>A00-!GL J LIA?!FNQLA>LP!0OXXGLA0-!=>?!XBIA>IL=GGN!O>0=HA!HBB?!F=>?GL>Qg/!

TUW/ \$FAMA!F=KA!EAA>!MAXBMI@!BH!L>A?LEGA!HBB?!XMBKL?A?!IB!?AI=L>A?!L>?LKL?O=G@/!e#XX\! &-!, \F/!(-!=I!RmZ/g!\$FA!i?ML>YL>Q!]=IAM!F=@!=!NAGGB]L@F!FOA!=>?!=>!B??!I=@IA/j!!e#XX\-!, \F/!(-!=I!RmZg/!

TUS/ \$FA!@XMA=?!BH!PBOQF-!HGO-!=>?!BIFAM!MA@XLM=IBMN!PB>?LILB>@!L>!IFA!?BM J @!F=KA!EAA>!

=IIMLEOIA?!IB!IFA!O>@=>LI=MN!PB>?LILB>@/!!e#XX\!&-!, \F/!(-!=I!RmT/g!, KA>!EAHBMA!IFA!'. 8 & 7 4RS!

X=>?A J LP-!) G=?A@!H=LGA?!IB!XMBKL?A!=?AbO=IA! J A?LP=G!P=MA!IB!?AI=L>A?!] B J A>!=>?! J A>/!e#XX\!&-!
, \F/!, -!=I!aW4m 1!W 4WR/g^[T]!!

 $Ta_/ \quad) \ G=?A@!B>GN!F=@!B>A!?BPIBM!L>!IFA!H=PLGLIN-! \] \ FB!L@!B>GN!=K=LG=EGA!HBOM!IL \ J \ A@!=! \\ \] \ AAY/!e\#XX \setminus !\&-! \ , \ \setminus F/! \ (-!=I!RmZ/g! \ ' MLILP=G! \ J \ A?LP=G!P=MA!L@!MBOIL>AGN!?AG=NA? \ q \ @B \ J \ AIL \ J \ A@!HBM! \\ \ J \ B>IF@ \ q \ BM!?A>LA?!BOIMLQFI/!e#XX \setminus !\&-! \ , \ \setminus F/! \ (-!=I!RUR4UT1!RmZ4mUg/!! \ 6 \ FA>! \ J \ A?LP=G!MAbOA@I@!=MA! \\ \ HL>=GGN!=??MA@@A?-!L>?LKL?O=G@!MAXBMI!>BI!EAL>Q!XMBXAMGN!IMA=IA?!BM!>BI!IMA=IA?!=I!=GG/!e#XX \setminus !\&-! \ , \ \setminus F/! \ (-!=I!RmZ/g! "MBKL?L>Q!LEOXMBHA>!BM! \ NGA>BG!L@!PB \ J \ J \ B>GN!O@A?!=@!=!EG=>YAI!@BGOILB>!IB!=>N!=>?!=GG! \\ \ J \ A?LP=G!L@@OA@/!!e#XX \setminus !\&-! \ , \ \setminus F/! \ (-!=I!RmZ/g! : BM!L>?LKL?O=G@! \] \ LIF!PFMB>LP! \ J \ A?LP=G!PB>?LILB>@-!LIIP=>! \\ \ J \ A?LP=G!PBAPAPP==! \\ \ J \ A?LP=G!PBAPAPP==! \\ \ J \ A?LP=G!PBAPAPP==! \\ \ J \$

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 $TaS/ \#GIFBOQF!IFA!@I=HH!=MA!>BI!O@L>Q!IFA!XMBXAM!XMBIAPILKA!QA=M-!IFAN!@ILGG!A>IAM!IFA!GLK4\\ L>Q!O>LI@-!IBOPF!IFA!?AI=L>A?!L>?LKL?O=G@-!IFALM!XAM@B>=G!EAGB>QL>Q@-!=>?!IFA!HBB?!IM=N@/!'66!\\ 7=LMB>!;=MMA?B!5=>PFAk!7AP/!o!Ta-!ZU!e#XX\!&&-!, \F/!8-!=I!RZR4ZWgl!) AM=M?B!8=MQ=@!7AP/!o!Ra!\\ e#XX\!&&-!, \F/!*-!=I!RaR4$

! !

Tm[/ 7AI=L>A?!L>?LKL?O=G@!=MA!>BI!=EGA!IB!@AA!IFA! J A?LP=G!@I=HH!L>!=!IL J AGN! J =>>AM-!=>?!]FA>!IFAN!=MA!=EGA!IB!@AA!IFA! J A?LP=G!@I=HH-!IFALM!IA J XAM=IOMA!L@!>BI!EAL>Q!I=YA>/! '66! ! !

!

TmW/ . >A!?AI=L>A?!L>?LKL?O=G!] =@!=?KL@A?!EN!=!>OM@A!IF=I!FA!F=?!IFA!HGO-!EOI!=>BIFAM!
>OM@A!L>HBM J A?!FL J !IF=I!FA!?L?!>BI/! '66! !

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$6JA^{=}J<'SJ=>G;H;A>=F'+@>H@J'$

 $TmS/ ; $ ' !L@!=>!L J J LQM=ILB>!?AIA>ILB>!PA>IAM!L>!"B J X=>B! ; A=PF-!: GBML?=!HBM!i>B>4 \\ PML J L>=G!=>?!GB] !@APOMLINj!?AI=L>A?!L>?LKL?O=G@!BXAM=IA?!EN!=!XMLK=IA!PB>IM=PIBM-!IFA!HBM4XMBHLI! \\ XML@B>!PBMXBM=ILB>!$FA!) , . !) MBOX-!&>P/!ei) , . jg/!e#XX\!&-!, \F/!(!=I!RaZ/g!) , . !F=@!LI@!FA=?4$

T[U/#I!; \$'-!L>?LKL?O=G@!] LIF!PFMB>LP! J A?LP=G!PB>?LILB>@!MAXBMIA?!IMA J A>?BO@!?LHHL4 POGILA@!MAPALKL>Q!>APA@@=MN!=PPB J J B?=ILB>@!HBM!IFALM!FA=GIF!XMBEGA J @-!@OPF!=@!?LAI=MN!=PPB J J B4 $?=ILB>@/!e\#XX\setminus!\&-!, \setminus F/! \ (\, !=I!RUZ/g! \, . \, >A!L>?LKL?O=G!MA J A J EAMA?!=! J =>! \,] \ LIF!?L=EAIA@!GB@L>Q!=!HL>QAM!$ $=@!=!MA@OGI!BH!IFA!L>=?AbO=IA! J A?LP=G!P=MA!=I! \ ; \$'/!e\#XX\setminus!\&-!, \setminus F/! \ (\, !=I!RUZ/g!)$

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 $T[a/ 7 OML>Q!IFA!@O J J AM!BH!T_RS-!IFAMA!] = @!=! J O J X@!BOIEMA=Y!=I!; $'!L>!] FLPF!?A4$ I=L>A?!L>?LKL?O=G@!] AMA!bO=M=>IL>A?/

! !

 $T[W/ 7AI=L>A?! J A>!=I!; $$'!=MA!@GAAXL>Q!L>!PAGG@!] LIF!HLKA!IB!@L\!L>?LKL?O=G@!L>!EO>Y4\\ EA?@-!] FLPF!=MA!>BI!@L\!HAAI!=X=MI/!'66&8=GAM=!%=J LMAk! 7 AP/!=I!o!m!e #XX\!&&-!, \F/!))-!=I!RSW4\\ T_Zg1!5B@=!: GAIA@! 7 AP/!=I!o!a!e #XX\!&&-!, \F/!<<-!=I!T_U4_Wg1!5B>I=N!: O>Ak! 7 AP/!=I!o!S!e #XX\!&&-!, \F/!: :-!=I!RSR4S [g1!%B@=@!'=M?A>=@! 7 AP/!=I!o!m!e #XX\!&&-!, \F/!, ,-!=I!RWm4S_g1!; AI=>PBOMI! 7 AP/!=I!o!a!e #XX\!&&-!, \F/! 7 7-!=I!RW4Wag1!: AMMALM=!; BMQA@! 7 AP/!=I!o!m!e #XX\!&&-!, \F/!&&-!T_S4RUg/!$FL@!&GAAXL>Q!=MM=>QA J A>I! J =YA@!LI!L J XB@@LEGA!IB!MA J =L>!@L\!HAAI!=X=MI!=>?!XM=PILPA!@BPL=G!?L@I=>PL>Q/!'66&5B@=!: GAIA@! 7 AP/!=I!o!a!e #XX\!&&-!, \F/!<<-!=I!T_U4_Wg1!; LEL=>B!5B=MA@! 7 AP/!=I!o![!e #XX\!&&-!, \F/!'\!&-!T_S4RUg/!* =I!o!a!e #XX\!&&-!, \F/!', ,-!=I!RWm4S_g1!; AI=>PBOMI! 7 AP/!=I!o!a!e #XX\!&&-!, \F/!', ,-!=I!RWm4S_g1!; AI=>PBOMI! 7 AP/!=I!o!a!e #XX\!&&-!, \F/!\.&-!T_S4RUg/!* =I!o!a!e #XX\!&&-!, \F/! 7 7-!=I!RW4Wag1!: AMMALM=!; BMQA@! 7 AP/!=I!o!m!e #XX\!&&-!, \F/!\., \F/!\.&-!T_S4RUg/!$

!

T[S/ \$FA!?AI=L>A?!L>?LKL?O=6@!=MA!PGB@A!IB!A=PF!IBQAIFAM!] FA>!IFAN!A=I!EAP=O@A!IFA!

PF=LM@!=MA!=II=PFA?!IB!IFA!HGBBM-!IFAN!F=KA!IB!@LI!=PMB@@!HMB J !A=PF!BIFAM!B>!IFA!I=EGA-!=>?!IFAMA!L@!

>BI!A>BOQF!MBB J !IB!MA J =L>!@L\!HAAI!=X=MI/& '66! 8 =GAM=!%= J LMAk! 7 AP/!=I!o!m!e#XX\!&&-! , \F/!)) -!=I!

RSW4T_Zg1!5B@=!: GAIA@! 7 AP/!=I!o!RZ!e#XX\!&&-! , \F/! < <-!=I!T_U4_Wg1!: AMMALM=!; BMQA@! 7 AP/!=I!o![!

e#XX\!&&-! , \F/!&&-!T_S4RUg1!%B@=@! '=M?A>=@! 7 AP/!=I!o!m!e#XX\!&&-! , \F/! , , -!=I!RWm4S_g1!%B?=@!

"A?MB! 7 AP/!=I!o!RZ!e#XX\!&&-! , \F/!00-!=I!TRa4RSg/! 7 AI=L>A?!L>?LKL?O=6@!] =LI!L>!GL>A!KAMN!PGB@A!IB!

A=PF!BIFAM!] FLGA!] =LIL>Q!IB!A>IAM!IFA!?L>L>Q!F=6G/! '66! 8 =GAM=!%= J LMAk! 7 AP/!=I!o!m!e#XX\!&&-! , \F/!

))-!=I!RSW4T_Zg1!; AI=>PBOMI! 7 AP/!=I!o!a!e#XX\!&&-! , \F/! 7 7-!=I!RW4Wag/!

 $TW_/ 5B J A!?AI=L>A?!L>?LKL?O=G@!=MA!A \setminus XAMLA>PL>Q!HGO!GLYA!@N J XIB J @-!L>PGO?L>Q!PBOQF4 \\ L>Q-!PB>QA@ILB>!=>?!?LHHLPOGIN!EMA=IFL>Q/! '66&!$

TWR/ 7 A@XLIA!F=KL>Q!@N J XIB J @-!?AI=L>A?!L>?LKL?O=G@!F=KA!?LHHLPOGIN!EAL>Q!=EGA!IB!@AA!

IFA! J A?LP=G!@I=HH!L>!=!IL J AGN! J =>>AM/! '668

/! . >A!?AI=L>AA!] LIF!=>!O>EA=M=EGA!PBOQF!@OE J LIIA?!=!] MLIIA>!MAbOA@I-!] A>I!I] LPA!IB!IFA! J A?4

LP=G!BHHLPA-!=>?!IFA>!PB J XG=L>A?!IB!=!QO=M?-!EAHBMA!FA!] =@!=GGB] A?!IB!@AA!=!?BPIBM/! '668

 $TWT/ $FAMA!F=0!EAA>!>B!Y>B]>!IA0I!BH!' . 8 \& 74RS!?B>A!L>!IFA!; $'!H=PLGLILA0/!'66 \& 5B0=! : GAIA0!7AP/!=I!o!RR!e#XX\!&&-!, \F/!<<-!=I!T_U4_Wgl!5B>=N!:O>Ak!7AP/!=I!o!R_!e#XX\!&&-!, \F/!::-! =I!RSR4S[g/!]$

TWZ/ #!MAPA>IGN!IM=>@HAMMA?!?AI=L>A?!XAM@B>!MAXBMIA?!F=KL>Q!A>IAMA?!; \$ '!]LIF!=!E=?!
PBG?!=>?!PBOQF-!EOI!]=@!>AKAM!IA@IA?!HBM!'. 8 & 7 4RS!BM!L@BG=IA?!HMB J!IFA!QA>AM=G!XBXOG=ILB>/!'66!

 $TWU/ \qquad 7 \text{ AI=L>A?!L>?LKL?O=G@!F=KA!IMBOEGA!=PPA@@L>Q! J A?LP=G!=IIA>ILB>-!L>PGO?L>Q!HBM!@AML4} \\ BO@!PFMB>LP!PB>?LILB>@!@OPF!=@!=@IF J =/! '66!$

g/! 2 A?LP=G!@I=HH!F=KA!EAPB J A!@B!BKAN] FAG J A?!] LIF!

IFA!>O J EAM!BH!@LPY! J A>!?AI=L>A?!L>!IFA!H=PLGLIN!IF=I!B>A!?BPIBM!Q=KA!=>!L>?LKL?O=G!FL@!A>ILMA!EBI4

IGA!BH!EGBB?!XMA@@OMA! J A?LPL>A!IB!I=YA!B>!FL@!B] >-!@L>PA!@FA!>B!GB>QAM!F=?!IL J A!IB!?L@XA>@A!FL@!

XLGG!MAQOG=MGN/! '66!

TWa/ #I!GA=@I!U_! J A>!F=KA!EAA>!EMBOQFI!L>IB!; \$ '!L>!IFA!X=@I!HA]!] AAY@/! '66!; BMQA@!

7 AP/!=I!o!RU!e#XX\!&&-!, \F/!&&-!T_S4RUg/! 1 A]!?AI=L>A?!XABXGA!F=KA!EAA>!XG=PA?!L J J A?L=IAGN!L>IB!

@F=MA?!MBB J @!]LIFBOI!EAL>Q!L@BG=IA?!HLM@I/! '66!; BMQA@! 7 AP/!=I!oRU!e#XX\!&&-!, \F/!&&-!T_S4RUg1!

%B@=@!'=M?A>=@!7 AP/!=I!oRT!e#XX\!&&-!, \F/!, ,-!=I!RWm4S g/!.>A!QMBOX!BH!>A]!=MMLK=G@!P=J A!

=EBOI!B>A!] AAY!=QB!HMB J! (MB J A-!] FLPF!=GMA=?N!F=?!PB>HLM J A?!' . 8&74RS!P=@A@-!=>?!IFAN!] AMA!

XG=PA?!] LIF!IFA!QA>AM=G!XBXOG=ILB>!BH!; \$ '/!'66!; AI=>PBOMI!7AP/!=I!oRZ!e#XX\!&&-!, \F/!77-!=I!RW4

Wag/!&>?LKL?O=G@!?AI=L>A?!=I!; \$ '!] AMA!IBG?!IFA!L>HAPIA?!XAM@B>!=I! (MB J A!] =@!@A>I!FB J A/!'66&

%B?=@!"A?MB!7AP/!=I!o![!e#XX\!&&-!, \F/!00-!=I!TRa4RSg/!

TWm/ \$FAMA!=MA!>B!XMAP=OILB>@!I=YA>!IB!XMBIAPI!IFB@A!] FB!=MA! J A?LP=GGN!KOG>AM=EGA!IB!
' . 8 & 7 4RS/! '66

TW[/ 7 AI=L>A?!L>?LKL?O=G@!XMAX=MA!IFA!HBB?!=>?!PGA=>!=I!; \$ ' /! . >A!?AI=L>A?!XAM@B>!
] FB!XMAKLBO@GN!XMAX=MA?!IFA!HBB?!=I!; \$ ' !MAXBMIA?!F=KL>Q!HGO!GLYA!@N J XIB J @/! '668

=G] =N@!] A=M! J =@Y@!] FA>!XMAX=ML>Q!IFA!HBB?!=>?!=MA!>BI!I=OQFI! ' . 8 & 7 4RS!FNQLA>A! J A=@OMA@/!)B& =I!o!S!e#XX\!&&-!,\F/!' '-!=I!R[Z4[Sgl!%B?=@!"A?MB!7AP/!=I!o!RU!e#XX\!&&-!,\F/!00-!=I!TRa4RSg/!!

/!7AI=L>A?!L>?LKL?O=G@!1FB!1BMY!L>!IFA!YLIPFA>!?B!>BI!

TWW/ 7 AI=L>A?!L>?LKL?O=G@!F=KA!>BI!BE@AMKA?!QMA=IAM!AHHBMI@!IB!PGA=>!L>!MA@XB>@A!IB!

' . 8 & 7 4RS/!%B?=@! "A?MB! 7 AP/!=I!o!Ra!e#XX\!&&-!, \F/!00-!=I!TRa4RSg/! 2 B@I!?AI=L>A?!L>?LKL?O=G@!

=MA!>BI!XMBKL?A?!] LIF! J =@Y@!BM!QGBKA@!] FA>!IFAN!PGA=>!PB J J B>!=MA=@/! '66& 8 =GAM=!%= J LMAk! 7 AP/!

=I!o!W!e#XX\!&&-!, \F/!)) -!=I!RSW4T_Zgl!5B@=!: GAIA@! 7 AP/!=I!o![!e#XX\!&&-!, \F/!<--!=I!T_U4_Wg/!

6 FA>!=@YA?!IB!PGA=>!IFALM!PAGG@-!B>GN!B>A!X=LM!BH!QGBKA@!L@!XMBKL?A?/! '66&5B>=N!: O>Ak! 7 AP/!=I!o!

R_!e#XX\!&&-!, \F/!::-!=I!RSR4S[g/!6 FA>!J=@Y@!=>?!QGBKA@!=MA!=K=LG=EGA-!IFAN!=MA!B>GN!HBM!PGA=>4

L>Q-!BIFAM] L@A!IFAMA!L@!>B!=PPA@@!IB!QGBKA@!=>?!J=@Y@/!'66&; AI=>PBOMI!7 AP/!=I!o!m!e#XX\!&&-!, \F/!

7 7-!=I!RW4Wag/!!

TWS/; \$ '!@I=HH!>BI!O@L>Q!XMBIAPILKA!QA=M!A>IAM!GLKL>Q!H=PLGLILA@!=>?!O@A!IFALM!E=MA!F=>?@!

IB!IBOPF!?AI=L>A?!L>?LKL?O=G@!=>?!IFALM!XAM@B>=G!EAGB>QL>Q@/!'66!; LEL=>B!5B=MA@!7 AP/!=I!o!Ra!

, \F/!''-!=I!R[Z4[Sg1!; AI=>PBOMI!7AP/!=I!o!a!e#XX\!&&-!, \F/!77-!=I!RW4Wag1!: AMMALM=!; BMQA@!7AP/!
=I!o!S!e#XX\!&&-!, \F/!&&-!T_S4RUg1!5B@=!: GAIA@!7AP/!=I!o!m!e#XX\!&&-!, \F/!<<-!=I!T_U4_Wg/!\$FAN!
F=KA!>BI!EAA>!QLKA>!F=>?!@=>LILkAM/!'66!%B?=@!"A?MB!7AP/!=I!o!W!e#XX\!&&-!, \F/!00-!=I!TRa4RSg/!!

!

TST/ 7 AI=L>A?!L>?LKL?O=G@!F=KA!>BI!EAA>!QLKA>!=>N!HBM J =G!A?OP=ILB>!=EBOI!FNQLA>A!

J A=@OMA@!IB!XMAKA>I!IFA!@XMA=?!BH! ' . 8 & 7 4RS/! '66!; LEL=>B!5B=MA@! 7 AP/!=I!o!RS!e#XX\!&&-!, \F/!

' '-!=I!R[Z4[Sg1!; AI=>PBOMI! 7 AP/!=I!o!W!e#XX\!&&-!, \F/! 7 7-!=I!RW4Wag1!: AMMALM=!; BMQA@! 7 AP/!=I!o!

Rm!e#XX\!&&-!, \F/!&&-!T_S4RUg-! 8 =GAM=!%= J LMAk! 7 AP/!=I!o!RT!e#XX\!&&-!, \F/!)) -!=I!RSW4T_Zg1!

%B@=@! '=M?A>=@! 7 AP/!=I!o!W!e#XX\!&&-!, \F/!, , -!=I!RWm4S_g1!5B@=!: GAIA@! 7 AP/!=I!o!W!e#XX\!&&-!, \F/!

<--!=I!T_U4_Wg1!5B>=N!: O>Ak! 7 AP/!=I!o!R[!e#XX\!&&-!, \F/!::-!=I!RSR4S[g1!%B?=@!"A?MB! 7 AP/!=I!o!

R_!e#XX\!&&-!, \F/!OO-!=I!TRa4RSg/!\$FA!B>GN!L>HBM J =ILB>!IFAN!F=KA!MAPALKA?!L@!HMB J!] =IPFL>Q!\$ 8!

=>?!XB@IAM@!B>!IFA!] =GG/! '66& 8 =GAM=!%= J LMAk! 7 AP/!=I!o!RT!e#XX\!&&-!, \F/!)) -!=I!RSW4T_Zg1!%B@=@!

' =M?A>=@! 7 AP/!=I!o!W!e#XX\!&&-!, \F/!, , -!=I!RWm4S_g/!!

 $TSZ/ 7AI=L>A?!L>?LKL?O=G@!F=KA!>B!=PPA@@!IB! J=@Y@!BM!QGBKA@-!AKA>!HMB J!IFA!PB J JL@4\\ @=MN/!; BMQA@!7AP/!=I!o!RT!e#XX\!&&-!, \F/!&&-!T_S4RUg1!; AI=>PBOMI!7AP/!=I!oR_!e#XX\!&&-!, \F/!77-!\\ =I!RW4Wag/!$

TSU/ ; \$ '!@I=HH!MBI=IA!L>!=>?!BOI!BH!; \$ '!B>!=!MAQOG=M!E=@L@/!5I=HH!QA>AM=GGN!GLKA!L>!IFA!

PB J J O>LILA@!>A=M!; \$ ' q =MA=@!] FAMA!IFAMA! J =>N!PB>HLM J A?!P=@A@!BH!' . 8 & 7 4RS/!!

TSa/ ; \$ '!F=@!=!FL@IBMN!BH!BOIEMA=Y@!BH!PB>I=QLBO!e#0500589.5789.9143 c mBT!

TSm/ .>! 2 =MPF!R[-!T_T_-!?AI=L>A?!XAM@B>@!=I!; \$ '!] AMA!@OE^APIA?!IB!=!a4FBOM!] =IAM!
@IBXX=QA-!?OML>Q!] FLPF!IFAN!F=?!>B!=PPA@@!IB!] =IAM!IB!] =@F!IFALM!F=>?@-!E=IFA-!BM!O@A!IFA!IBLGAL/[S!
#+%`G') FH@J>=H; [@G'HA'&@H@>H;A>'4JAVJ=W'

!

 $TS [/ : BM!BKAM!Ra!NA=M0-!7 < 5f\&', !F=0!0BOQFI!=>?!BEI=L>A?!PB>QMA00LB>=G!HO>?L>Q!HBM! \\ LI0!\#GIAM>=ILKA0!IB!7AIA>ILB>!ei\#$7jg!XMBQM=J-!]FLPF!O0A0!0OXAMKL0A?!MAGA=0A-!P=0A!J=>=QA4 \\ JA>I-!=>?!JB>LIBML>Q!BH!L>?LKL?O=G0!L>0IA=?!BH!?AIA>ILB>/W-!&', !F=0!MAXA=IA?GN!IBG?!'B>QMA00!IF=I! \\ IFA!\#$7!XMBQM=J!L>PMA=0A0!&', `0!BXAM=ILB>=G!AHHAPILKA>A00!=>?!L>?LKL?O=G!PBJXGL=>PA!]LIF!MA4 \\ GA=0A!PB>?LILB>0/!!$

 $[\]begin{tabular}{l} \begin{tabular}{l} \begin{ta$

[&]quot;-!&', `@!POMMA>I!#\$7!XMBQM=J!L@!P=GGA?!&>IA>@LKA!5OXAMKL@LB>!#XXA=M=>PA!"MBQM=J!&&&!e&5#"!
&&&g/!\$FA!XMBQM=J!HA=IOMA@!?LHHAMA>I!GAKAG@!BH!P=@A!J=>=QAJA>I!L>PGO?L>Q!L>4XAM@B>!BM!IAGAXFB>LP!
JAAIL>Q@-!O>=>>BO>PA?!FBJA!KL@LI@-!@PFA?OGA?!BHHLPA!KL@LI@-!=>?!PBOMI!=>?!JAAIL>Q!=GAMI@/!5BJA!
=MA!=G@B!A>MBGGA?!L>!IAPF>BGBQN4E=@A?!JB>LIBML>Q!L>PGO?L>Q!IAGAXFB>LP!JB>LIBML>Q-!)"5!JB>LIBM4
L>Q!KL=!=>YGA!EM=PAGAI-!=>?!@J=MI!XFB>A!=XXGLP=ILB>!JB>LIBML>Q!P=GGA?!5J=MI+L>Y!IF=I!O@A@!H=PL=G!
MAPBQ>LILB>!=>?!GBP=ILB>!JB>LIBML>Q!KL=!)"5/!\$FA!XMLK=IA!PB>IM=PIBM!IF=I!BXAM=IA@!IFA!XMBQM=J!
HBM!&',!L@!;&-!&>P/-!=!JFBGGN4BJ>A?!@OE@L?L=MN!BH!\$FA!),.!)MBOX-!&>P/!'66&'%5!%AXBMI!%UaW_U-!
&JJLQM=ILB>C!#GIAM>=ILKA@!IB!7AIA>ILB>!e#\$7g!"MBQM=J@-!eOOG/!W-!T_RSg/!.>!2=MPF!TZ-!T_T-!

 $TSW/ $FA!7 < 5!: *T_TR! 'B>QMA@@LB>=G!; O?QAI!0O@ILHLP=ILB>!HBM!\&', !@I=IA@!IF=I!LI!PB@I@!\\ RTa/_m!XAM!?=N!IB!^=LG!=>!=?OGI!L J J LQM=ILB>!L>!\&', !PO@IB?N/!$FA!=KAM=QA!PB@I!XAM!#$7!X=MILPL4\\ X=>I!L@! U/UZ!XAM!?=N/!$FA!7 < 5!: *T_TR!HO>?L>Q!MAbOA@I!@AAY@!IB!@OXXBMI!RT_-____!?=LGN!X=MILPL4\\ X=>I@!L>!#$7/WR!$

 $TSS/ \# !T_RU!) \# . !\% AXBMI!HBO>?!IF=I!Sa v !BH!IFB@A!B>!HOGG4@AMKLPA! \# \$ 7 !eIFB@A!IF=I!L>4$ $PGO?A!P=@A! J =>= QA J A>Ig!=XXA=M!HBM!IFALM!HL>=G!FA=ML>Q@/^WT}! \# PPBM?L>Q!IB!T_R [!PB>IM=PI!?=I=-!@O4$ XAMKL@LB>!PBOXGA?!] LIF!@B J A!P=@A! J =>= QA J A>I!MA@OGI@!L>!=! J BMA!IF=>!SS v !=XXA=M=>PA!M=IA!HBM!=GG! $L J J LQM=ILB>!PBOMI!FA=ML>Q@-!=>?!=! J BMA!IF=>!SR v !=XXA=M=>PA!M=IA!HBM!HL>=G!FA=ML>Q@/^WZ}!$

 $Z_{-}/ \ \#@!BH!\#XMLG!U-!T_{-}!\&'\ , !F=@!WS-WaR!L>?LKL?O=G@!A>MBGGA?!L>!\#\$7-!L>PGO?L>Q!a-_a[!L>!IFA!\ 2\ L=J\ L!=MA=/WU!$

 $[\]begin{tabular}{l} $WR!7 < 5f\&', !: *T_TR!'B>QMA@@LB>=G!; Q?QAI!0O@ILHLP=ILB>-!=I!.XAM=ILB>@!x!5OXXBMI!RZT-!R[R-!R[Z-!FIIX@Cff]]]/?F@/QBKf@LIA@f?AH=OGIfHLGA@fXOEGLP=ILB>@fO/@/DLJJLQM=ILB>D=>?DPO@IBJ@DA>4\\ $HBMPAJA>I/X?H/!7OA!IB!PBOMI!E=PYGBQ@!=>?!?AG=N@!HBM!IFB@A!]FB!=MA!>B>4?AI=L>A?-!#$7!X=MILPL4\\ $X=>I@!=MA!A>MBGGA?!HBM!=!GB>QAM!XAMLB?!BH!ILJA!IF=>!IFA!XAMLB?!BH!ILJA!IF=I!L>?LKL?O=G@!MAJ=L>!L>!?AIA>ILB>/!<B]AKAM-!AKA>!PB>@L?AML>Q!IFA!=KAM=QA!GA>QIF!BH!@I=N!L>!?AIA>ILB>!=>?!IFA!XAMLB?!BH!LJA!LS>!=>?!IFA!=KAM=QA!GA>QIF!BH!LJA!L>!?AIA>ILB>!=>?!IFA!=KAM=QA!GA>QIF!BH!LJA!L>!?AIA>ILB>!=>?LKL?O=G!?AI=L>A?!IF=>!IFB@A!MAGA=@A?!B>!#$7/!$

 $^{^{\}rm WT}!$) # . 4Ra4Tm-!#GIAM>=ILKA@!IB! 7 AIA>ILB>-!=I!Z_!e 1 BK/!T_RUg-!=K=LG=EGA!=I! FIIX@Cff]]]/Q=B/QBKf=@@AI@fm[_fmmmSRR/X?H/!

/%2)/'.*)0%5,*R'

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 $Z_R/ \quad !\$FA!7OA!"MBPA@@! 'G=O@A!XMBKL?A@!IF=I!>B!XAM@B>!@F=GG! iEA!?AXMLKA?!BH!GLHA-!GLE4$ $AMIN-!BM!XMBXAMIN-! \] \ LIFBOI!?OA!XMBPA@@!BH!G= \] \ /j !9/5/! 'B>@I/!= JA>?/!8/!&I@!XMBIAPILB>@!A\IA>?!IB!$ $AKAMN!XAM@B>! \] \ LIFL>!IFA!>=ILB>`@!EBM?AM@!MAQ=M?GA@@!BH!LJJLQM=ILB>!@I=IO@/!\$?7H6V<\&LE&18?M-!UTm!$ 9/5/!m[-![[-!eRS[mg!ei,KA>!B>A!]FB@A!XMA@A>PA!L>!IFL@!PBO>IMN!L@!O>G=]HOG-!L>KBGO>I=MN-!BM!IM=>4 @LIBMN!L@!A>ILIGA?!IB!IF=I!PB>@ILIOILB>=G!XMBIAPILB>/jg/!

) K &: @'4JA?@GG'*;VXH'HA'*@=GA>=TF\'(=Y@'''A>74:>;H;[@'+;[;F'&@H@>H;A>'

- $Z_T/ ! 6 \text{ FA}>! \text{IFA}! \text{QBKAM}> \text{J} \text{A}>! \text{I}=\text{YA}@!=! \text{XA} \text{M}@B}>! \text{L}> \text{IB}! \text{PO}@\text{IB}? \text{N}!=>?! ?\text{AI}=\text{L}>@! \text{FL} \text{J} != \text{Q}=\text{L}>@\text{I}! \text{IFA}!$ XA M @B> @! J LG-! IFA! ' B> @! LIOILB>! L J XB @ A @! QDXB>! IFA! QBKAM> J A>! !=! ?OIN! IB!= @ Q O J A! MA @ XB> @ LELGLIN! HBM! $\text{IF}=\text{I}! ?\text{AI}=\text{L}>\text{AA} \text{`@}! \text{@}=\text{HAIN}!=>?! \text{QA}>\text{AM}=\text{G}! \text{]} \text{AGGEAL}> \text{Q}/! '66 \text{\&} \text{O} 6>> 8: F \text{\&} \text{LE} \text{\&} \text{\&} \text{C} ! \text{\&} : 6P-! \text{a}_\text{S}! \text{9}/5/! \text{Ta}-! \text{ZT}! \text{eRSSZg}/!$ 9>?AM! IFA! , LQFIF! # J A>? J A> I-! IFA!) BKAM> J A> I! J O @! XMBKL? A! PML J L>= G! ?AI=L>AA @!] LIF! E=@ LP! FO 4 $\text{J}=>!>\text{AA} ?\text{@}-! \text{L}>\text{PGO}? \text{L}>\text{Q}! \text{MA}=\text{@} \text{B}>=\text{EGA}! \text{@}=\text{HAIN}/!!) \textit{BE} \text{\&}!}$
- $Z_Z/ \qquad \$FA!QBKAM>JA>I!KLBG=IA@!IFA!\ , LQFIF! \# JA>? JA>I!LH!LI!PB>HL>A@!=!PML JL>=G!?AI=L>AA! \\ L>!O>@=HA!PB>?LILB>@/!)BE!=I!ZZ/!!$
- $Z_U/ \qquad 6 \text{ FA}>!\text{IFA}!\text{QBKAM}> \textbf{J} \text{ A}>!\text{!?AI}=\textbf{L}>@!=!\text{XAM}@B}>!\text{HBM}!\text{IFA}!\text{KLBG}=\text{ILB}}>!\text{BH}!=>!\textbf{L} \textbf{ J} \textbf{ J} \text{LQM}=\text{ILB}>!G=]-!$ $\text{IFA}!\text{XAM}@B>!\textbf{L}@!=!\text{PLKLG}!\text{?AI}=\textbf{L}>\text{AA}-!\text{AKA}>!\text{LH}!\text{FA}!\text{F}=@!=!\text{XMLBM}!\text{PML} \textbf{ J} \textbf{ L}>=G!\text{PB}>\text{KLPILB}>/! '66\&Q?BLPB?<\&LE\&1?L&<-!}$ $\text{aZZ}!\text{ 9}/5/!\text{m} \text{ [W-!mS}_!\text{eT}_\text{Rg}/!$
- $Z_a/ \#@!PLKLG!?AI=L>AA@-!"AILILB>AM@!=MA!A>ILIGA?!IB! J BMA!PB>@L?AM=IA!IMA=I J A>I!IF=>!$ $PML J L>=G!?AI=L>AA@-!] FB@A!PB>?LILB>@!BH!PB>HL>A J A>I!=MA!?A@LQ>A?!IB!XO>L@F/!5AA! \$?;<H&LE&S>?E& 16A^7&9&*9;;E-!ZZ_!:/!#XX`\!R[S-!RWT!eRRIF!'LW!T_Sg!ebOBIL>Q!$

Z_m/ \$FA!: LHIF! # J A>? J A>I! 7 OA! "MBPA@@! 'G=O@A!XMBFLELI@!XO>L@F J A>I!BH!XABXGA!L>!PLKLG!

PO@IB?N/!46>>&LE& 5 9>@8<H-!UUR! 9/5/!aT_-!aZa!>/Rm!eRS [Sgl! \$?F>I7?&LE& '?KA>6<-!Z[a!:/Z?!RTmS-!

RT[Z!eRRIF! 'LM/!T__Ugl!O?KK&LE& 16R?>N&*7PE-![[U!:/T?!Ram[-!Ra[T!eRRIF! 'LM/!RSWag!ePLIL>Q!):=

F;?H?K&LE! 5;8FH7-!UZ !9/5/!maR-!m[R!>/!U !eRS[[gg/!

 $Z_{[/]} \$B!A@I=EGL@F!IF=I!=!X=MILPOG=M!PB>?LILB>!BM!MA@IMLPILB>!BH!?AIA>ILB>!PB>@ILIOIA@!LJ4\\ XAM J L@@LEGA!XO>L@F J A>I-!=!XAILILB>AM! J O@I!@FB] !ALIFAM!eRg!=>!A\XMA@@A?!L>IA>I!IB!XO>L@FI!BM!eTg!\\ G=PY!BH!=!MA=@B>=EGA!MAG=ILB>@FLX!IB!=!GAQLIL J =IA!QBKAM> J A>I=G!XOMXB@A-!HMB J !] FLPF!=>!L>IA>I!IB!\\ XO>L@F! J =N!EA!L>HAMMA?/! '66& 5 9>&&-H-!UUR! 9/5/!=I!aZW/!#E@A>I!=>!A\XGLPLI!L>IA>ILB>!IB!XO>L@F-!=!\\ PBOMI! J O@I!=XXGN!=!I] B4X=MI!IA@IC! i : LM@I-!=!PBOMI! J O@I!=@Y!] FAIFAM!=>N!rGAQLIL J =IA!QB=G^!] =@!\\ @AMKA?!EN!IFA!XML@B>!PB>?LILB>@/!5APB>?-!LI! J O@I!=@Y!] FAIFAM!IFA!PB>?LILB>@!=MA!rMA=@B>=EGN!MA4\\ G=IA?^!IB!IF=I!QB=G/j!J?C9NP&LE&4?>BV8:&*7PE-!WZa!:/Z?!RZZW-!RZUa!eRRIF! 'LM/!T_Rmg/!is&tH!PB>?L4\\ ILB>@!=MA!@B!A\IMA J A!IF=I!GA@@!F=M@F!=GIAM>=ILKA@!=MA!A=@LGN!=K=LG=EGA-!IFB@A!PB>?LILB>@!PB>@ILIOIA!\\ rXO>L@F J A>I/ j!. 6>@?8;&LE& - &>N6;F-!WmW!:/5OXX/!RZSm-!RURT!e5/7/!) =/!RSSUg!ePLIL>Q! 5 9>&&-H-!UUR!\\ 9/5/!=I!aZW4ZS!>/T_g/!$

Z_W/ is 6 tFA>!IFA!5I=IA!I=YA@!=!XAM@B>!L>IB!LI@!PO@IB?N!=>?!FBG?@!FL J !IFAMA!=Q=L>@I!FL@!

] LGG-!IFA! 'B>@ILIOILB>!L J XB@A@!OXB>!LI!=!PBMMA@XB>?L>Q!?OIN!IB!=@@O J A!@B J A!MA@XB>@LELGLIN!HBM!FL@!

@=HAIN!=>?!QA>AM=G!] AGG4EAL>Q/j! 16 'H?:6P&LE& 5 &::6N?F9&*7PE& 16A^7E&9&'9CE&'6;L</-!UWS!9/5/!RWS-!

RSS4T__!eRSWSg/!\$FA!QBKAM> J A>I! J O@I!XMBKL?A!?AI=L>A?!L>?LKL?O=G@!] LIF!E=@LP!>APA@@LILA@-!@OPF!

=@!=?AbO=IA! J A?LP=G!P=MA-!HBB?-!PGBIFL>Q-!=>?!@FAGIAMI!IFA!H=LGOMA!IB!XMBKL?A!IFA@A!>APA@@LILA@!KLB4

G=IA@!?OA!XMBPA@@/!O?KK-![[U!:/T?!=I!Ra [ZI!*99R&6T&;6>E&%<7?76&9&&.6<<86;&LE&'H6;8@&9&&\$9:;96&

*7P/-!U_T!:/Z?!R_ST-!RRRa!eRRIF!' LM/!T__ag/!

ZR_/ \$B!?A J B>@IM=IA!IF=I!%A@XB>?A>I@!=MA!=PIL>Q!] LIF!?AGLEAM=IA!L>?LHHAMA>PA-!"AILILB>4

AM@! J O@I!@FB] !A\XB@OMA!IB!=!@OE@I=>IL=G!ML@Y!BH!@AMLBO@!F=M J !BH!] FLPF!%A@XB>?A>I@!=MA!=] =MA!=>?!

F=KA!?L@MAQ=M?A?/!S?;K6;&LE&4;6::?:-!aRR!9/5/!WTa-!WZU-!WZ[4ZW!eRSSUg1!\$?;NI;P&LE&5?;B6:-!

SZm!:/Z?!RTT[-!RTZZ!eRRIF!'LM/!T_RSg1!

IM=QLP!AKA>Ij !EAHBMA!@AAYL>Q!MAGLAH!HMB J !=!PB>?LILB>!BH!PB>HL>A J A>I!IF=I!O>PB>@ILIOILB>=GGN!A>4 $?=>QAM@!IFA J /! ~66!O6>>8:F-&a_S! 9/5/!=I!ZZ!eFBG?L>Q!XML@B>AM^@! , LQFI!\# J A>? J A>I!PG=L J !PBOG?!EA!$ E=@A?!OXB>!XB@@LEGA!HOIOMA!F=M J !IB!FA=GIF-!=@!] AGG!=@!XMA@A>I!F=M J g/!!!

ZRZ/ i 1 BM!?BA@!LI! J = IIAM!IF = I!@B J A!L> J = IA@! J = N!>BI!EA! = HHAPIA?!EN!IFA!PB>?LILB>-!=>?! IF = I!IFA!F = M J !L@!IFO@-!L>!= !@A>@A-!B>GN!XBIA> IL=G!F = M J /!\$FA! 'BOMI!F = @!HBO>?!=>! , LQFIF! # J A>? J A>I! KLBG = ILB> !rAKA> !IFBOQF!LI!] = @!>BI! = GGAQA?!IF = I!IFA!GLYAGN!F = M J !] BOG?!BPPOM!L J J A?L = IAGN!=>?!AKA>! $IFBOQF!IFA!XB@@LEGA!L> HAPILB> ! J LQFI!>BI!= HHAPI!= GG!BH!IFB@A!A \setminus XB@A?/j!.877> G&LE&JG@6; <9: &*7P/!$ $*9KK^*:-!R_!: /Z?!RaZa-!RaUZ!eRRIF! 'LM'!RSSUg!ebOBIL>Q!O6>> 8: F-!a_S!9/5/!=I!ZZg/!!$

6K'''\$X@')**"+,#'&A?HJ;>@''

!

ZRU/ 6 FA>!IFA!QBKAM> J A>I!F=@!XMB J OGQ=IA?!isMtAQOG=ILB>@!] LIF!IFA!HBMPA!=>?!AHHAPI!BH!

G=]-j!IFB@A!MAQOG=ILB>@!i@OXXGA J A>I!IFA!E=MA!EB>A@j!BH!HA?AM=G!@I=IOIA@!!2 :876B&'7?76<&6T&;6>E&OC=
C?;B&&LE&'H?IFH:6<<PD!ZU[!9/5/!Tm_-!Tmm-!TmW!eRSaUg!eMAKAM@L>Q!L>!L J J LQM=ILB>!P=@A!=HIAM!MAKLA]!

BH!]=MM=>I!HBM!?AXBMI=ILB>g/!#QA>PLA@!J O@I!HBGGB]!IFALM!B]>!iA\L@IL>Q!K=GL?!MAQOG=ILB>@-j!AKA>!

]FAMA!QBKAM> J A>I!BHHLPAM@!F=KA!EMB=?!?L@PMAILB>-!@OPF!=@!L>!IFA!=MA=!BH!L J J LQM=ILB>/!)B/!=I!TmWI!

<66&?><9!\$9;79:&LE&"I&M-!URa!9/5/!RSS-!TZa!eRS[Ug!eis&tI!L@!L>PO J EA>I!OXB>!=QA>PLA@!IB!HBGGB]!

IFALM!B]>!XMBPA?OMA@!/!/!/AKA>!]FAMA!SIFANt!=MA!XB@@LEGN!JBMA!MLQBMBO@!IF=>!BIFAM]L@A!]BOG?!EA!

MABOOLMA?/jgl!4?77>6&LE&SOO-!ZSZ!:/Z?!RZZ_-!RZZm!e7/'/!'LM/!T__ag!eiOCC?;B&!F=@!PBJA!IB!@I=>?!HBM!

IFA!XMBXB@LILB>!IF=I!=QA>PLA@!J=N!>BI!KLBG=IA!IFALM!B]>!MOGA@!=>?!MAQOG=ILB>@!IB!IFA!XMA^O?LPA!BH!

BIFAM@/jg/!;MA=PFA@!BH!OCC?;B&"@!MOGA!PB>@ILIOIA!KLBG=ILB>@!BH!EBIF!IFA!#?JL>L@IM=ILKA!"MBPA?OMA@!

#PI!ei#"#jg!=>?!IFA!:LHIF!#JA>?JA>FO@!7OA!"MBPA@@!'G=O@A/!!

 $ZRa/ = 6 \text{ FLGA!KLBG=ILB>0!BH!iL>IAM>=G!=QA>PN!XMBPA?OMA@j!?B!>BI!=G]=N@!MAbOLMA!=!MAJA?N-!} \\ OCC?;B\& @!MOGA!=XXGLA@!] LIF!HOGG!HBMPA!] FA>!iIFA!MLQFI@!BM!L>IAMA@I@!BH!IFA!BE^APIL>Q!X=MINj!=MA!i=H4 \\ HAPIA?/j! \& 9:87>?&LE&), 'M&STm!:/T?!RmT-!Rm[!eT?/!'LM/!RSSRg!ePLIL>Q!P=@A@g!ei #PP=M?L!?BPIM>A!L@! \\ XMAJL@A?!B>!HO>?=JA>I=G!>BILB>@!BH!H=LM!XG=N!O>?AMGNL>Q!IFA!PB>PAXI!BH!?OA!XMBPA@@jgl!<<math>66\&?><9\&$ $5 \&><9:\&LE\&*9KK^*;\&9@\&'9CE\&'6CE-!Z[W!:/Z?!aUR-!aUa4Um!emIF!'LM/!T_Ug!e>BIL>Q!IF=I!=>!OCC?;B&!KLB4 \\ G=ILB>!J=N!EA!=!?OA!XMBPA@@!KLBG=ILB>-!=>?!IFA!QBKAM>JA>I`@!=PILB>!J=N!EA!@AI!=@L?A!XOM@O=>I!IB! \\ IFA!#"#gl!'?K66:?M.):CE&LE&2E'E&O&;&S9;C6-!RU[!:/Z?!RRUW-!RRaZ!eSIF!'LM/!RSSWg!ei#>!=QA>PN^@! \\ H=LGOMA!IB!HBGGB]!LI@!B]>!MAQOG=ILB>@!/!/!/!J=N!MA@OG!!L>!=!KLBG=ILB>!BH!=>!L>?LKL?O=G`@!PB>@ILIOILB>=G! \\ MLQF!!IB!?OA!XMBPA@@/jg/!$

!

+K' (H=H@'+J@=H@<'&=>V@J'

!

 $ZRm/ \qquad \$FA! 7 OA! "MBPA@@! ' G=O@A! iL J XB@A@!=!?OIN!B>!@I=IA!=PIBM@!IB!XMBIAPI!BM!P=MA!HBM!PLIL4\\ kA>@!L>!] FA>!IFA!@I=IA!=HHLM J=ILKAGN!XG=PA@!=!X=MILPOG=M!L>?LKL?O=G!L>!=!XB@LILB>!BH!?=>QAM!IFA!L>?L4\\ KL?O=G!] BOG?!>BI!BIFAM] L@A!F=KA!H=PA?/j!-;6F9;P&LE&*87P&9@"9F6;<D&O;R-!S[U!:/T?!R_m-!R_R_!eWIF!'LM/!RSSTg!eA>!E=>Pg/!$

 $ZR[/ \$FA!QBKAM>JA>I!KLBG=IA@!=>!L>?LKL?O=G^@!MLQFI!IB!?OA!XMBPA@@!]FA>!LI!eRg!i=HHLMJ=4\\ ILKAGN!XG=PAs@t!sIFAt!L>?LKL?O=G!L>!?=>QAM-j!eTg!EN!i=PIL>Q!]LIF!r?AGLEAM=IA!L>?LHHAMA>PA!IB!s=t!\\ Y>B]>!BM!BEKLBO@!?=>QAM/j!!6::6BP&LE&*87P&9@&"8BF6@86>B-!UZS!:/Z?!R_aa-!R_mT!eSIF!'LM!T_mg!\\ ebOBIL>Q! <math>\$I:F6$; &LE&*87P&9@&->?<F9V

 $ZRW/ i\#!?OIN!BH!XMBIAPILB>!=ML@A@!]FAMA!IFA!@I=IA!F=@!=!PO@IB?L=G!MAG=ILB>@FLX!]LIF!IFA! \\ L>?LKL?O=G-!=ML@L>Q!HMB J !@OPF!PLMPO J @I=>PA@!=@!L>P=MPAM=ILB>!L>!XML@B>!BM!L>KBGO>I=MN!PB J J LI4 \\ J A>I!L>!=! J A>I=G!L>@ILIOILB>/j! I?L8<&LE&*?;76;-!aaa!:/Z?!S [S-!SWT!>/T!eRRIF!'LM/!T__Sg/!$FA!B>GN! \\ MAG=ILB>@FLX@!IF=I!=OIB J =ILP=GGN!QLKA!ML@A!IB!=!QBKAM> J A>I=G!?OIN!IB!XMBIAPI!L>?LKL?O=G@!HMB J !F=M J ! \\ O>?AM!IFA!@OE@I=>ILKA!?OA!XMBPA@@!PG=O@A!=MA!PO@IB?L=G!MAG=ILB>@FLX@!IFMBOQF!]FLPF!IFA!QBKAM>4 \\ J A>I!?AXMLKA@!L>?LKL?O=G@!BH!IFALM!GLEAMIN!=>?!IFO@!BH!IFALM!=ELGLIN!IB!I=YA!P=MA!BH!IFA J @AGKA@/!!'66& \\ 5 H876&LE&/6K?CR<-!RWZ!:/Z?!RTaZ-!RTa[!eRRIF!'LM/!RSSSg/!]$

!

ZRS/ \$FA!QBKAM> J A>I!=PI@!] LIF!?AGLEAM=IA!L>?LHHAMA>PA!IB!=!Y>B] >!BM!BEKLBO@!?=>QAM!

] FA>!LI!MAPBQ>LkA@!=>!O>MA=@B>=EGA!ML@Y!=>?!=PIO=GGN!Y>B] L>QGN!A\XB@A@!IFA!XAILILB>AM/!#>!O>4

MA=@B>=EGA!ML@Y!L>PGO?A@!HOIOMA!F=M J !P=O@A?!EN!PB>?LILB>@!BH!PB>HL>A J A>I/! '66&O6>>8: F&LE& \$ C ! 8:=
:6P-!a_S!9/5/!Ta-!ZZ!eRSSZg/!

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ZTm/ %A@XB>?A>I@!F=KA!H=LGA?!IB!PB J XGN!] LIF!IFA! ' 7 ' !QOL?AGL>A@/!!%A@XB>?A>I@!F=KA! >BI!isAt>@OMAs?t!IF=I!@OHHLPLA>I!@IBPY@!BH!FNQLA>A!@OXXGLA@-!PGA=>L>Q!@OXXGLA@-!"" , -!=>?! J A?LP=G! @OXXGLA@!/!/!!=MA!B>!F=>?/j!*9KA?;6&' 7 '!) OL?=>PA!=I![!e#XX\!&-!, \F/!:-!=I!aUgl!V87H&7 APG=M=4 ILB>@!BH!&>?LKL?O=G@!7 AI=L>A?!=I!=GG!IFMAA!H=PLGLILA@C! (MB J A!e 6 =M@=>A!7 AP/-!<=@=>!7 AP/-!:=M=F! 7 AP/-!#MM=Y!7 AP/g1!) G=?A@!e7=LMB>!; =MMA?B!5=>PFAk!7 AP/-!!\$=FL J L!"AMAk!7 AP/-!!: M=>YGL>!%= J B>!) B>k=GAk!7 AP/-!) AM=M?B!8=MQ=@!7 AP/-!=>?!: M=>PL@PB!%LKAMB!8=GAMB>!7 AP/g1!=>?!; \$ '!e

 $ZTS/ & \% A@XB > ?A > I@!F = KA! > BI!L J XGA J A > IA?! = ?AbO = IA!@BPL = G!?L@I = > PL > Q!XM = PILPA@/! *9K = A?; 6\&' 7'!) OL? = > PA! = I!RR!e #XX \ !&-!, \F/!: -! = I!aWg!! V87H&7 APG = M = ILB > @!BH!& > ?LKL?O = G@!7 AI = L > A?! = I! = GG!IFMAA!H = PLGLILA@C! (MB J A!e 6 = M@ = > A!7 AP/-! < = @ = > !7 AP/-! : = M = F!7 AP/-! #MM = Y!7 AP/g1!) G = ?A@!e$

L>!PGB@A!@GAAXL>Q-!A=IL>Q-!=>?!GLKL>Q!bO=MIAM@!=I! (MB J A-!) G=?A@-!=>?!; \$ '/!!: OMIFAM-!EAP=O@A!%A4

@XB>?A>I@!P=>!=>?!@FBOG?!MAGA=@A!"AILILB>AM@!=>?!IFB@A!@L J LG=MGN!@LIO=IA?-!iPBFBMI!bO=M=>IL>Aj!L@!

>BI!IFA!B>GN!i=K=LG=EGA!BXILB>/j!!!

!

!

ZZT/ 'BFBMIL>Q!L@!>BI!IFA!@= J A!=@!bO=M=>IL>A!BM! J A?LP=G!L@BG=ILB>!=>?!IFA! '7'! J =YA@!

LI!PGA=M!IF=I!PBFBMIL>Q!L@!IB!EA!O@A?!B>GN!=@!=!G=@I!MA@BMI!L>!IFB@A!iPBMAAPILB>=G!H=PLGLILA@!=>?!?AIA>4

ILB>!PA>IAM@!?B!>BI!F=KA!A>BOQF!L>?LKL?O=G!PAGG@j!HBM!bO=M=>IL>A!BM! J A?LP=G!L@BG=ILB>/!&>IAML J!

) OL?=>PA-!=I!Z-!Ra!e#XX\-!, \F/!:-!=I!a_-!mTg/!\$FA!'7'!=>?!BIFAM! J A?LP=G!A\XAMI!BXL>LB>@!PB>4

HLM J !IF=I!PBFBMIL>Q!L>?LKL?O=G@!] FB!F=KA!>BI!EAA>!PB>HLM J A?!IB!EA!L>HAPIA?!] LIF!'. 8&74RS!

i XOI@!AKAMNB>A!=I!KAMN!FLQF!ML@Y!BH!PB>IM=PIL>Q!=>?!@XMA=?L>Q!'. 8&74RS/j!5FL>!7APG/-!o!ZZ!

e, \F/!Tg/!!!

ZZZ/ .>! 2 =MPF!ZR-!T_T_-!IFA! "MA@L?A>I!OX?=IA?!IFA!QOL?=>PA-!MA>= J L>Q!LI!iZ_!7=N@!IB!

5GB] !IFA!5XMA=?-j!=>?!=GB>Q!] LIF!IFA! 6 FLIA!<BO@A! 'BMB>=KLMO@!\$=@Y!:BMPA!OMQA?!# J AMLP=>@!IB!

PB>IL>OA!IB!=?FAMA!IB!IFA! '7 '!QOL?AGL>A@!=>?!A\X=>?!PB J J O>LIN! J LILQ=ILB>!AHHBMI@/j!.>!#XMLG!R-!

 $PB \ J \ XGN! \] \ LIF! \ ' \ 7 \ ' \ !QOL?AGL>A@!B>!@BPL=G!?L@I=>PL>Q!=>?!bO=M=>IL>L>Q!O>GA@@!\%A@XB>?A>I@!MAGA=@A! \\ ?AI=L>A?! \ J \ A>!=>?! \] \ B \ J \ A>!B>!=!G=MQA!@P=GA/j!!) \\ BE&=I!oo!ZS4U_/!! \ 7 \ M'!5FL>!PB>PGO?A?!IF=I!LI!L@! i \ J \ N! \\ XMBHA@@LB>=G!BXL>LB>!IF=I!H=LGOMA!IB!MAGA=@A!?OML>Q!IFA! \ ' \ . \ 8 \& 7 \ 4RS!X=>?A \ J \ LP!L@!=!KLBG=ILB>!BH!IFA! \\$

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X6=PA!"AILILB>AM@!=I!QMA=IAM!ML@Y!BH!PB>IM=PIL>Q! ' . 8 & 7 4RS!EN!L J X6A J A>IA?!XM=PILPA@!IF=I!IM=>@HAM!

XABXGA!L>IB!=>?!BOI!BH!H=PL6LILA@-!=>?!A J X6BN@!PBFBMI!bO=M=>IL>L>Q!=XXMB=PF!h!IF=I!?M=@ILP=66N!L>4

PMA=@A@!IFA!?=>QAM!BH!IFA!KLMO@!@XMA=?L>Q/!%A@XB>?A>I@!F=KA!=PIA?!]LIF!?AGLEAM=IA!L>?LHHAMA>PA!IB!

IFA!PGA=M!AGAK=IA?!GAKAG@!BH!IFMA=I!P=O@A?!IB!"AILILB>AM@/!!

!

ZaT/ !%A@XB>?A>I@!F=KA!=HHLM J =ILKAGN!XG=PA?!"AILILB>AM@!L>!?=>QAM!EN!HBMPL>Q!IFA J !L>IB!

=!XB@LILB>! J BMA!?=>QAMBO@!IF=>!LI!HBO>?!IFA J -!A\XB@L>Q!IFA J !IB!AGAK=IA?!?=>QAMBO@!EN!H=LGL>Q!IB!

HBGGB] L>Q! ' 7 '!QOL?AGL>A@!L>PGO?L>Q!EN!IM=>@HAMML>Q!XABXGA!= J B>Q!H=PLGLILA@!=>?!L J XMBXAMGN!O@4

L>Q!PBFBMI!bO=M=>IL>A@!L>!=! J =>>AM!IF=I!XG=PA@!"AILILB>AM@!L>!=! J BMA!?=>QAMBO@!@LIO=ILB>!IF=I!LI!

HBO>?!IFA J /!%A@XB>?A>I@! J =?A!IFA!=HHLM J =ILKA!?APL@LB>!IB!>BI!MAGA=@A!"AILILB>AM@!BM!O@A! # \$ 7 @-!

=>?!L>@IA=?!L J XGA J A>IA?!PBFBMI!bO=M=>IL>A@!L>!=! J =>>AM!IF=I!?M=@ILP=GGN!L>PMA=@A!IFA!XB@@LELGLIN!

BH!IM=>@ J L@@LB>-!L>HAPILB>-!=>?!H=PLGLIN4] L?A!BOIEMA=Y!EN!QMBOXL>Q!IBQAIFAM!XABXGA!] FB!F=KA!=G4

MA=?N!EAA>!A\XB@A?!IB!IFA!KLMO@/! '66&5FL>!7APG/!oU_!e, \F/!Tg!!) MAAM!7APG/-!ooZU4Za!e, \F/!Zg/!!!!

 $ZaZ/ %A@XB>?A>I@!PB>IL>OA!IB!?AI=L>!"AILILB>AM@!] LIFBOI!I=YL>Q!>APA@@=MN!XMAP=OILB>@! \\ IB!MA?OPA!IFA!ML@Y!BH! ' . 8 & 7 4RS!IM=>@ J L@@LB>/!%A@XB>?A>I@!F=KA!IFO@!A\XB@A?!"AILILB>AM@!IB!=! \\ QMA=IAM!ML@Y!BH!PB>IM=PIL>Q! ' . 8 & 7 4RS!IF=>!IFAN!] BOG?!F=KA!BIFAM] L@A!H=PA?/! \\$

 $ZaU/ %A@XB>?A>I@!PB>IL>OA?!IB!=PILKAGN!?L@MAQ=M?!IFA!IFMA=I!BH!IFA!X=>?A\ J\ LP/!"AILILB>4$ $AM@!=MA!?AI=L>A?!L>!PB>?LILB>@!IF=I!A\ XB@A!IFA\ J\ !IB!=!FALQFIA>A?!ML@Y!BH!PB>IM=PIL>Q!\ '\ .\ 8\&7\ 4RS/!$ $%A@XB>?A>I@!=MA!PB>HL>L>Q! "AILILB>AM@!L>!PGB@A!XMB\ L\ J\ LIN!IB!BIFAM!?AI=L>AA@!=>?!\&\ '\ ,\ !BHHLPAM@-!MA>4$?AML>Q! "AILILB>AM@!A>ILMAGN!O>=EGA!IB!XM=PILPA!>APA@@=MN!@BPL=G!?L@I=>PL>Q/!!!

Zaa/

H=PA!LH!IFAN!] AMA!>BI!L>!?AIA>ILB>!=>?!] AMA!=EGA!IB!I=YA!>APA@@=MN!XMAP=OILB>@!IB!XMBIAPI!IFA J 4 @AGKA@/!

!

 $Za[/ %A@XB>?A>I@!L\ J\ XGA\ J\ A>IA?!=!PBFBMI!bO=M=>IL>A!=XXMB=PF!IF=I!?BA@!>BI!PB\ J\ XGN!$ $]\ LIF!\ '\ 7\ '\ !QOL?AGL>A@!=>?!?M=@ILP=GGN!L>PMA=@A@!IFA!ML@Y!BH!\ '\ .\ 8\&7$

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4*)8%*'.,*'*%/#%.'

6 < %, . . %, !"AILILB>AM@!MAbOA@I!IF=I!IFA! 'BOMI!QM=>I!IFA!HBGGB]L>Q!MAGLAHC!!

- =/ #@@O J A!^OML@?LPILB>!BKAM!IFL@! J =IIAMI!
- $E/ \qquad , >^BL>!\%A@XB>?A>I@!HMB J !IM=>@HAMML>Q! "AILILB>AM@-!=>?!IFA!PG=@@!IFAN!MAXMA@A>I-!\\ \\ HMB J ! (MB J A-!) G=?A@-!BM! ; $ '-!O>ILG!IFA! 'BOMI!F=@!?APL?A?!IFL@!=PILB>1!!$
- P/ &@@OA!=! 6 MLI!BH! <=EA=@! 'BMXO@!B>!IFA!QMBO>?!IF=I!%A@XB>?A>I@`!PB>IL>OA?!?AIA>4

 ILB>!BH!"AILILB>AM@-!=>?!IFA!PG=@@!IFAN!MAXMA@A>I-!KLBG=IA@!IFA!7OA!"MBPA@@! 'G=O@A!=>?!BM?AM!IFA!

 L J J A?L=IA!MAGA=@A!BH!"AILILB>AM@!=>?!IFA!PG=@@!IFAN!MAXMA@A>I-!] LIF!=XXMBXML=IA!XMAP=OILB>=MN!

 XOEGLP!FA=GIF! J A=@OMA@1!
- ?/ &@@OA!L>^O>PILKA!MAGLAH!BM?AML>Q!%A@XB>?A>I@!IB!L J JA?L=IAGN!MAGA=@A!"AILILB>AM@!
 =>?!=GG!@L J LG=MGN!@LIO=IA?!?AI=L>AA@!L>! (MB J A!5AMKLPA!"MBPA@@L>Q! 'A>IAM-!) G=?A@! 'BO>IN!7 AIA>4

 ILB>! 'A>IAM-!=>?!; MB] =M?!\$M=>@LILB>=G! 'A>IAM!] LIF!=XXMBXML=IA!XMAP=OILB>=MN!XOEGLP!FA=GIF!

 J A=@OMA@-!B>!IFA!QMBO>?@!IF=I!PB>IL>OA?!?AIA>ILB>!KLBG=IA@!IFA!PB>@ILIOILB>=G! 7 OA!"MBPA@@!MLQFI@!

 BH!"AILILB>AM@!=>?!IFA!PG=@@!IFAN!MAXMA@A>II!!
- A/ &@@OA!=!?APG=M=ILB>!IF=I!%A@XB>?A>I@`!PB>IL>OA?!?AIA>ILB>!BH!"AILILB>AN@!=>?!=66!

 PG=@@! J A J EAN@!PMA=IA@!=>!O>?OA!L>PMA=@A?!ML@Y!BH!@AKANA!L66>A@@!BM!?A=IF-!=>?!IFO@!KLB6=IA@!IFA!

 7 OA!"MBPA@@! 'G=O@A1!!
- H/ &@@OA!=>!BM?AM!XMBFLELIL>Q!%A@XB>?A>I@!HMB J !XG=PL>Q!>A] !?AI=L>AA@!L>!IFA! (MB J A! 5AMKLPA! "MBPA@@L>Q! 'A>IAM-!) G=?A@! 'BO>IN!7AIA>ILB>! 'A>IAM-!=>?!; MB] =M?!\$M=>@LILB>=G! 'A>IAM! O>ILG! '. 8&74RS!>B!GB>QAM!XB@A@!=!IFMA=I!L>!:GBML?=/!!
- Q/ #] =M?!"AILILB>AM@!IFALM!PB@I@!=>?!MA=@B>=EGA!=IIBM>AN@`!HAA@!L>!IFL@!=PILB>!O>?AM!

 IFA!, bO=G!#PPA@@!IB!OO@ILPA!#PI!ei,#0#jg-!=@!= J A>?A?-!a!9/5/'/!u!a U!=>?!TW!9/5/'/!u!TURT-!

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                                                      !
     !
     =>?!B>!=>N!BIFAM!E=@L@!^O@ILHLA?!O>?AM!G=]1!=>?!!
             F/
                     ) M=>I!=>N!BIFAM!=>?!HOMIFAM!MAGLAH!IF=I!IFL@! 'BOMI! J =N!?AA J !HLI!=>?!XMBXAM/!
     7 = IA?C!! # XMLG!RZ-!T_T_!
                              !!!!!
                                           %A@XAPIHOGN!@OE J LIIA?-!
                                           ; NC!<u>f@f!%AEAPP=!5F=MXGA@@</u>!!!!!!!
                                           %,;,''#!5<#%"+,55!
                                           : GBML?=!; =M! 1 B/!_RZR_TU!
                                           \% . 2 *!+, \% 1, \%!
                                           : GBML?=!; =M! 1 B/!RRm[RZ!
                                           ( #\$ # \% \& 1 # ! 2 / ! ) . 2 , 3 - ! + = ] !5IO?A > I!
                                            2, \%, 7 \& \$ < ! < . : 2 # 1 - ! + = ] !5IO?A>I!
                                            2 #\% \& #! #/! + + . \%, 15-! + = ]!5IO?A>I!
                                           0#'; !5/!2. %5, -!+=] !5I0?A>I!
                                            . + \& 8 \& \#!) /! \# \% \& 5, -! += ] !5 IO? A>I!
                                            2 #\% \& #! #/! "\&5, ++\&-!+= ] !5IO?A>I!
                                           91&8, %5&$*!.:!2&#2&!5'<..+!.:!+#6!
                                           & 2 2 & ) % # $& . 1!' + & 1 & '!
                                           RZRR! 2 LGGAM! 7 MLKA! 5 OLIA-!, 4T [Z!
                                            'BM=G!) = EGA@-!: GBML?=!ZZRUm!!
                                           $AGC!eZ_ag!TWU4Za[m!
                                           :=\C!eZ_ag!TWU4m_ST!
                                           M@F=MXGA@@ \sim G= 1/JL=JL/A?O!
     !
                                           %#"&7!7,:,15,!1,$6.%(!
                                           5 \#\% \# < !\$/!) \&++2 \# 1 n!
                                           RR!; MB=?]=N-!50LIA!mRa!
                                           1 A ]!*BMY-!1 *!R U!
                                           $AG/C!eTRTg!WUZ4_SR_!
                                           :=\C!eTRTg!Ta[4]_ZZ!
                                           QMAQBMN ~ ?AHA>@A>AI ] BMY/BMQ!
                                           @=M=F \sim ?AHA>@A>AI ]BMY/BMQ!
                                           n+;9\&O?C\&(\&C\&OBK\&<<\&9:\&+6:B\&:F\&
                                           !
```

2 #% (!# 1 7%, 6!"%#7#! :G=/!;=M!1B/!SRSS[! #1\$<.1*!%&'<#%7!7.2&1)9,3! :G=/!;=M!1B/!R__TTZU! "%#7#!9%&3#%-!"++'! ZRSR!'BM=G!6=N-!50LIA!a__!

<u>4%\$#\$#, "%*74/)#"\$#..(`'1%*#.#+)\$#, "'</u>

!

!

 $\&!=\mathbf{J} \; !@OE \; \mathbf{J} \; LIIL>Q!IFL@!KAMLHLP=ILB>!B>!EAF=GH!BH!IFA! \; "AILILB>AM4" \\ G=L>ILHH@!EAP=O@A!\&!=\mathbf{J} \; !B>A!BH!$