APPENDIX A

STELLA program specifications

for five

tax policy scenarios

Please note that the variables used in the following model specifications may vary slightly from the named variables in Chapter 4. Additional variables have been specified in Chapter in the interests of clarity.

MINTAX policy

```
storage_size = 0
INIT TMW = storage_size
Mine_Salinity = 3000
PotSD = TMW*Mine_Salinity/1000
Threshold = 420
Strflo = GRAPH(time)
RFlow = Strflo
RSalt = GRAPH(time)
RSalt_AssimC = if (Threshold*RFlow/1000) -RSalt>0 then (Threshold*RFlow/1000)-
RSalt else 0
NTR = 50
ZT = if PotSD>=RSalt_AssimC+Threshold*TMW/1000 then NTR else 0
AlphaI = 20.94
BetaI = 0.31
Inflow = AlphaI*Strflo^BetaI
spill = If TMW-storage_size>0 then TMW-storage_size else 0
WatDisch = if ZT=0 then TMW - spill else 0
INIT R&M_Flow = 0
Total_Flow = R&M_Flow
INIT Salt_Load = 0
freeSD = if ZT=0 then (WatDisch+spill)*Mine_Salinity/1000 else 0
AsalinityS = if spill>0 then ((RSalt_AssimC+(spill*Threshold/1000))/spill)*1000 else 0
SRPM = if spill>0 then if Mine_Salinity-AsalinityS>0 then (Mine_Salinity-
AsalinityS)/1000 else 0 else 0
tax = 100+15*SRPM
salt_spill = spill*Mine_Salinity/1000
TSR = spill*SRPM
freeSS = spill*threshold/1000
vtss = salt_spill-TSR-freeSS
ntrSS = salt_spill-freeSS
Salt_Discharge = if ZT=0 then freeSD else if tax>100 then vtss +freeSS else
ntrSS+freeSS
Total_Salt = Salt_Load
RSalin1 = if (Total_Flow>0) then (Total_Salt*1000/Total_Flow) else 0
RSalin0 = if (RFlow>0) and (Rsalt>0) then (RSalt*1000/RFlow) else 0
TMS = TMW*Mine_Salinity/1000
INIT TVCtreat = 0

INIT Total_Tax_Rev = 0
```

```
allowed_SS = AsalinityS/1000*spill
TVCpML = (100*SRPM)+(0.5*SRPM*15*SRPM)
TVCpw = spill*TVCpML
Tax_Revenue = if ZT=0 then 0 else if tax>100 then tax*vtss else ntrSS*NTR
TaxRev = Tax_Revenue
cost&rev = TaxRev+TVCpw
TMW(t) = TMW(t - dt) + (Inflow - WatDisch - spill) * dt
R&M_Flow(t) = R&M_Flow(t - dt) + (RFlow + WatDisch - Total_Flow) * dt
Salt_Load(t) = Salt_Load(t - dt) + ( RSalt + Salt_Discharge - Total_Salt) * dt
TVCtreat(t) = TVCtreat(t - dt) + (TVCpw) * dt
Total_Tax_Rev(t) = Total_Tax_Rev(t - dt) + (TaxRev) * dt
PotSD = TMW*Mine_Salinity/1000
Strflo = GRAPH(time)
RFlow = Strflo
RSalt = GRAPH(time)
RSalt_AssimC = if (Threshold*RFlow/1000) -RSalt>0 then (Threshold*RFlow/1000)-
RSalt else 0
ZT = if PotSD>=RSalt_AssimC+Threshold*TMW/1000 then NTR else 0
Inflow = AlphaI*Strflo^BetaI
spill = If TMW-storage_size>0 then TMW-storage_size else 0
WatDisch = if ZT=0 then TMW - spill else 0
Total_Flow = R&M_Flow
freeSD = if ZT=0 then (WatDisch+spill)*Mine_Salinity/1000 else 0
AsalinityS = if spill>0 then ((RSalt_AssimC+(spill*Threshold/1000))/spill)*1000 else 0
SRPM = if spill>0 then if Mine_Salinity-AsalinityS>0 then (Mine_Salinity-
AsalinityS)/1000 else 0 else 0
tax = 100+15*SRPM
salt_spill = spill*Mine_Salinity/1000
TSR = spill*SRPM
freeSS = spill*threshold/1000
vtss = salt_spill-TSR-freeSS
ntrSS = salt_spill-freeSS
Salt_Discharge = if ZT=0 then freeSD else if tax>100 then vtss +freeSS else
ntrSS+freeSS
Total_Salt = Salt_Load
RSalin1 = if (Total_Flow>0) then (Total_Salt*1000/Total_Flow) else 0
RSalin0 = if (RFlow>0) and (Rsalt>0) then (RSalt*1000/RFlow) else 0
TMS = TMW*Mine_Salinity/1000
allowed_SS = AsalinityS/1000*spill
TVCpML = (100*SRPM)+(0.5*SRPM*15*SRPM)
TVCpw = spill*TVCpML
Tax_Revenue = if ZT=0 then 0 else if tax>100 then tax*vtss else ntrSS*NTR
TaxRev = Tax_Revenue
cost&rev = TaxRev+TVCpw
```

MINTAX-NFSD

```
INIT TMW = storage_size
Mine_Salinity = 3000
PotSD = TMW*Mine_Salinity/1000
Threshold = 420
Strflo = GRAPH(time)
`RFlow = Strflo
RSalt = GRAPH(time)
RSalt_AssimC = if (Threshold*RF ow/1000) -RSalt>0 then (Threshold*RFlow/1000)-
RSalt else 0
NTR = 100
ZT = if PotSD>=RSalt_AssimC+T hreshold*TMW/1000 then NTR else 0
AlphaI = 20.94
BetaI = 0.31
Inflow = AlphaI*Strflo^BetaI
spill = If TMW-storage_size>0 the n TMW-storage_size else 0
WatDisch = if ZT=0 then TMW - spill else 0
INIT R&M_Flow = 0
Total_Flow = R&M_Flow
INIT Salt_Load = 0
freeSD = if ZT=0 then (WatDisch+spill)*Mine_Salinity/1000 else 0
allowed_salt = RSalt_AssimC
AsalinityS = if spill>0 then ((allowed_salt)/spill)*1000 else 0
SRPM = if spill>0 then if Mine_Salinity-AsalinityS>0 then (Mine_Salinity-
AsalinityS)/1000 else 0 else 0
tax = 100+15*SRPM
salt_spill = spill*Mine_Salinity/1000
TSR = spill*SRPM
freeSS = spill*threshold/1000
vtss = salt_spill-TSR-freeSS
ntrSS = salt_spill-freeSS
Salt_Discharge = if ZT=0 then freeSD else if tax>100 then vtss +freeSS else
ntrSS+freeSS
Total_Salt = Salt_Load
RSalin1 = if (Total_Flow>0) then (Total_Salt*1000/Total_Flow) else 0
RSalin0 = if (RFlow>0) and (Rsalt>0) then (RSalt*1000/RFlow) else 0
INIT TVCtreat = 0
INIT Total_Tax_Rev = 0
TVCpML = (100*SRPM)+(0.5*SRPM*15*SRPM)
TVC = spill*TVCpML
TVCpw = TVC
Tax_Revenue = if ZT=0 then 0 else if tax>100 then tax*(vtss+freeSS) else (freeSS
+ntrSS)*NTR
TaxRev = Tax_Revenue
cost&rev = Tax_Revenue+TVC
TMW(t) = TMW(t - dt) + (Inflow - WatDisch - spill) * dt
R&M_Flow(t) = R&M_Flow(t - dt) + (RFlow + WatDisch + spill - Total_Flow) * dt
Salt_Load(t) = Salt_Load(t - dt) + (RSalt + Salt_Discharge - Total_Salt) * dt
TVCtreat(t) = TVCtreat(t - dt) + (TVCpw) * dt
```

Total_Tax_Rev(t) = Total_Tax_Rev(t - dt) + (TaxRev) * dt
PotSD = TMW*Mine_Salinity/1000
Strflo = GRAPH(time)
RFlow = Strflo
RSalt = GRAPH(time)
RSalt_AssimC = if (Threshold*RFlow/1000) -RSalt>0 then (Threshold*RFlow/1000)-RSalt else 0
ZT = if PotSD>=RSalt_AssimC+Threshold*TMW/1000 then NTR else 0
Inflow = AlphaI*Strflo^BetaI
spill = If TMW-storage_size>0 then TMW-storage_size else 0
WatDisch = if ZT=0 then TMW - spill else 0
Total_Flow = R&M_Flow
freeSD = if ZT=0 then (WatDisch+spill)*Mine_Salinity/1000 else 0
allowed_salt = RSalt_AssimC
AsalinityS = if spill>0 then ((allowed_salt)/spill)*1000 else 0
SRPM = if spill>0 then if Mine_Sa inity-AsalinityS>0 then (Mine_Salinity-AsalinityS)/1000 else 0 else 0
tax = 100+15*SRPM
salt_spill = spill*Mine_Salinity/1000
TSR = spill*SRPM
freeSS = spill*threshold/1000
vtss = salt_spill-TSR-freeSS
ntrSS = salt_spill-freeSS
Salt_Discharge = if ZT=0 then freeSD else if tax>100 then vtss +freeSS else ntrSS+freeSS
Total_Salt = Salt_Load
RSalin1 = if (Total_Flow>0) then (Total_Salt*1000/Total_Flow) else 0
RSalin0 = if (RFlow>0) and (Rsalt>0) then (RSalt*1000/RFlow) else 0
TVCpML = (100*SRPM)+(0.5*SRPM*15*SRPM)
TVC = spill*TVCpML
TVCpw = TVC
Tax_Revenue = if ZT=0 then 0 else if tax>100 then tax*(vtss+freeSS) else (freeSS +ntrSS)*NTR
TaxRev = Tax_Revenue
cost&rev = Tax_Revenue+TVC

MAXTAX policy

INIT TMW = storage_size
Threshold = 420
Strflo = GRAPH(time)
RFlow = Strflo
RSalt = GRAPH(time)
RSalt_AssimC = if (Threshold*RFlow/1000) -RSalt>0 then (Threshold*RFlow/1000)-RSalt else 0
allowed_salinity = if TMW>0 then (RSalt_AssimC/TMW)*1000 else 0
Mine_Salinity = 3000

```
SRper_ML = If allowed_salinity<Mine_Salinity then (Mine_Salinity-
allowed_salinity)/1000 else 0
tax = 100+15*SRper_ML
AlphaI = 20.94
BetaI = 0.31
Inflow = AlphaI*Strflo^BetaI
spill = if TMW-storage_size >0 then TMW-storage_size else 0
WatDisch = If tax =100 then TMW spill else 0
INIT R&M_Flow = 0
Total_Flow = R&M_Flow
INIT Salt_Load = 0
MSRperML = (tax-100)/15
taxedSS = ((Mine_Salinity/1000-MSRperML)*spill)
taxedSD = WatDisch*Mine_Salinity/1000
Salt_Discharge = taxedSS+taxedSD
Total_Salt = Salt_Load
INIT TotSR = 0
RSalin1 = if (Total_Flow>0) then (Total_Salt*1000/Total_Flow) else 0
Voltreat = spill
TSR = MSRperML*Voltreat
RSalin0 = if (RFlow>0) and (Rsalt>0) then (RSalt*1000/RFlow) else 0
TMS = TMW*Mine_Salinity/1000
TSRpw = TSR
Tax_Revenue = (taxedSS)*tax
TaxRev = Tax_Revenue
TVCpML = 100*MSRperML+0.5*MSRperML*(tax-100)
TVCpw = Voltreat*TVCpML
VCtreat = TVCpw
taxrev&TC = TaxRev+VCtreat
salt_spill = spill*Mine_Salinity/1000
INIT Total_VCtreat = 0
aTVC = Total_VCtreat/520
INIT Total_Tax_Rev = 0
freeSS = spill*Threshold/1000
Salt_Inflow = Inflow*Mine_Salinity/1000
aTaxR = Total_Tax_Rev/520
aTotC = aTaxR+aTVC
aSR = TotSR/520
INIT TotSD = 0
SD = Salt_Discharge
aSD = TotSD/520
TMW(t) = TMW(t - dt) + (Inflow - WatDisch - spill) * dt
R&M_Flow(t) = R&M_Flow(t - dt) + (RFlow + WatDisch + spill - Total_Flow) * dt
Salt_Load(t) = Salt_Load(t - dt) + (RSalt + Salt_Discharge - Total_Salt) * dt
TotSR(t) = TotSR(t - dt) + (TSRpw) * dt
Total_VCtreat(t) = Total_VCtreat(t - dt) + (VCtreat) * dt
Total_Tax_Rev(t) = Total_Tax_Rev(t - dt) + (TaxRev) * dt
TotSD(t) = TotSD(t - dt) + (SD) * dt
Strflo = GRAPH(time)
```

RFlow = Strflo
RSalt = GRAPH(time)
RSalt_AssimC = if (Threshold*RFlow/1000) -RSalt>0 then (Threshold*RFlow/1000)-RSalt else 0
allowed_salinity = if TMW>0 then (RSalt_AssimC/TMW)*1000 else 0
SRper_ML = If allowed_salinity<Mine_Salinity then (Mine_Salinity-allowed_salinity)/1000 else 0
tax = 100+15*SRper_ML
Inflow = AlphaI*Strflo^BetaI
spill = if TMW-storage_size >0 then TMW-storage_size else 0
WatDisch = If tax =100 then TMW-spill else 0
Total_Flow = R&M_Flow
MSRperML = (tax-100)/15
taxedSS = ((Mine_Salinity/1000-MSRperML)*spill)
taxedSD = WatDisch*Mine_Salinity/1000
Salt_Discharge = taxedSS+taxedSD
Total_Salt = Salt_Load
RSalin1 = if (Total_Flow>0) then (Total_Salt*1000/Total_Flow) else 0
Voltreat = spill
TSR = MSRperML*Voltreat
RSalin0 = if (RFlow>0) and (Rsalt>0) then (RSalt*1000/RFlow) else 0
TMS = TMW*Mine_Salinity/1000
TSRpw = TSR
Tax_Revenue = (taxedSS)*tax
TaxRev = Tax_Revenue
TVCpML = 100*MSRperML+0.5*MSRperML*(tax-100)
TVCpw = Voltreat*TVCpML
VCtreat = TVCpw
taxrev&TC = TaxRev+VCtreat
salt_spill = spill*Mine_Salinity/1000
freeSS = spill*Threshold/1000
Salt_Inflow = Inflow*Mine_Salinity/1000

MAXTAX-FD policy

storage_size = 0
INIT TMW = storage_size
Threshold = 420
Strflo = GRAPH(time)
RFlow = Strflo
RSalt = GRAPH(time)
RSalt_AssimC = if (Threshold*RFlow/1000) -RSalt>0 then (Threshold*RFlow/1000)-RSalt else 0
allowd_salt = RSalt_AssimC+(Threshold*TMW/1000)
allowed_salinity = if TMW>0 then (allowd_salt/TMW)*1000 else 0
Mine_Salinity = 3000
SRper_ML = If allowed_salinity<Mine_Salinity then (Mine_Salinity-allowed_salinity)/1000 else 0

```
tax = If SRper_ML>0 then (100+15*SRper_ML) else 0
AlphaI = 20.94
BetaI = 0.31
Inflow = AlphaI*Strflo^BetaI
spill = if TMW-storage_size >0 then TMW-storage_size else 0
WatDisch = If tax =0 then TMW-spill else 0
INIT R&M_Flow = 0
Total_Flow = R&M_Flow
INIT Salt_Load = 0
taxedSS = if tax>0 then (spill*(Mine_Salinity/1000-Threshold/1000-SRper_ML))else 0
free_SD = If storage_size>0 then WatDisch*Mine_Salinity/1000 else (if tax=0 then
spill*(Mine_Salinity-Threshold)/1000 else 0)
freeSS = spill*Threshold/1000
Salt_Discharge =  taxedSS+free_SD+freeSS
Total_Salt = Salt_Load
INIT TotSR = 0
RSalin1 = if (Total_Flow>0) then (Total_Salt*1000/Total_Flow) else 0
Voltreat = spill
TSR = SRper_ML*Voltreat
RSalin0 = if (RFlow>0) and (Rsalt>0) then (RSalt*1000/RFlow) else 0
TSRpw = TSR
Tax_Revenue = (taxedSS)*tax
TaxRev = Tax_Revenue
TVCpML = 100*SRper_ML+(0.5*SRper_ML*15*SRper_ML)
TVCpw = Voltreat*TVCpML
VCtreat = TVCpw
taxrev&TC = TaxRev+VCtreat
INIT Total_Tax_Rev = 0
INIT Total_VCtreat = 0
TMW(t) = TMW(t - dt) + (Inflow - WatDisch - spill) * dt
R&M_Flow(t) = R&M_Flow(t - dt) + (RFlow + WatDisch + spill - Total_Flow) * dt
Salt_Load(t) = Salt_Load(t - dt) + (RSalt + Salt_Discharge - Total_Salt) * dt
TotSR(t) = TotSR(t - dt) + (TSRpw) * dt
Total_Tax_Rev(t) = Total_Tax_Rev(t - dt) + (TaxRev) * dt
Total_VCtreat(t) = Total_VCtreat(t - dt) + (VCtreat) * dt
Strflo = GRAPH(time)
RFlow = Strflo
RSalt = GRAPH(time)
RSalt_AssimC = if (Threshold*RFlow/1000) -RSalt>0 then (Threshold*RFlow/1000)-
RSalt else 0
allowd_salt = RSalt_AssimC+(Threshold*TMW/1000)
allowed_salinity = if TMW>0 then (allowd_salt/TMW)*1000 else 0
SRper_ML = If allowed_salinity<Mine_Salinity then (Mine_Salinity-
allowed_salinity)/1000 else 0
tax = If SRper_ML>0 then (100+15*SRper_ML) else 0
Inflow = AlphaI*Strflo^BetaI
spill = if TMW-storage_size >0 then TMW-storage_size else 0
WatDisch = If tax =0 then TMW-spill else 0
Total_Flow = R&M_Flow
```

taxedSS = if tax>0 then (spill*(Mine_Salinity/1000-Threshold/1000-SRper_ML))else 0
free_SD = If storage_size>0 then WatDisch*Mine_Salinity/1000 else (if tax=0 then spill*(Mine_Salinity-Threshold)/1000 else 0)
freeSS = spill*Threshold/1000
Salt_Discharge = taxedSS+free_SD+freeSS
Total_Salt = Salt_Load
RSalin1 = if (Total_Flow>0) then (Total_Salt*1000/Total_Flow) else 0
Voltreat = spill
TSR = SRper_ML*Voltreat
RSalin0 = if (RFlow>0) and (Rsalt>0) then (RSalt*1000/RFlow) else 0
TSRpw = TSR
Tax_Revenue = (taxedSS)*tax
TaxRev = Tax_Revenue
TVCpML = 100*SRper_ML+(0.5*SRper_ML*15*SRper_ML)
TVCpw = Voltreat*TVCpML
VCtreat = TVCpw
taxrev&TC = TaxRev+VCtreat

FLAT TAX

INIT TMW = 0
storage_size = 0
AlphaI = 20.94
Strflo = GRAPH(time)
BetaI = 0.31
Inflow = AlphaI*Strflo^BetaI
spill = if TMW-storage_size >0 then TMW-storage_size else 0
INIT R&M_Flow = 0
RFlow = Strflo
Total_Flow = R&M_Flow
INIT Salt_Load = 0
RSalt = GRAPH(time)
Threshold = 420
freeSS = spill*threshold/1000
Mine_Salinity = 3000
tax = 100
MSRperML = (tax-100)/15
Voltreat = spill
taxedSS = (((Mine_Salinity/1000)-MSRperML)*Voltreat)-freeSS
Salt_Discharge = freeSS+taxedSS
Total_Salt = Salt_Load
INIT Total_Tax_Rev = 0

aTAXrev = Total_Tax_Rev/520
INIT Total_VCtreat = 0

```
avTVC = Total_VCtreat/520
aTotalcost = aTAXrev+avTVC
AlphaC = 180000
RSalin1 = if (Total_Flow>0) then (Total_Salt*1000/Total_Flow) else 0
TSR = MSRperML*Voltreat
RSalin0 = if (RFlow>0) and (Rsalt>0) then (RSalt*1000/RFlow) else 0
TMS = TMW*Mine_Salinity/1000
Tax_Revenue = taxedSS*tax
TaxRev = Tax_Revenue
TVCpML = 100*MSRperML+0.5*MSRperML*(tax-100)
TVCpw = Voltreat*TVCpML
VCtreat = TVCpw
taxrev&TC = TaxRev+VCtreat
INIT totSR = 0
aSR = totSR/520
salt_spill = spill*Mine_Salinity/100
INIT TSD = 0
aSD = TSD/520
TSR1 = TSR
Salt_Inflow = Inflow*Mine_Salinity/1000
SD1 = Salt_Discharge
TMW(t) = TMW(t - dt) + (Inflow - spill) * dt
R&M_Flow(t) = R&M_Flow(t - dt) + (RFlow + spill - Total_Flow) * dt

Salt_Load(t) = Salt_Load(t - dt) + (RSalt + Salt_Discharge - Total_Salt) * dt
Total_Tax_Rev(t) = Total_Tax_Rev(t - dt) + (TaxRev) * dt
Total_VCtreat(t) = Total_VCtreat(t - dt) + (VCtreat) * dt
totSR(t) = totSR(t - dt) + (TSR1) * dt
TSD(t) = TSD(t - dt) + (SD1) * dt
Strflo = GRAPH(time)
Inflow = AlphaI*Strflo^BetaI
spill = if TMW-storage_size >0 then TMW-storage_size else 0
RFlow = Strflo
Total_Flow = R&M_Flow
RSalt = GRAPH(time)
freeSS = spill*threshold/1000
MSRperML = (tax-100)/15
Voltreat = spill
taxedSS = (((Mine_Salinity/1000)-MSRperML)*Voltreat)-freeSS
Salt_Discharge = freeSS+taxedSS
Total_Salt = Salt_Load
aTAXrev = Total_Tax_Rev/520
avTVC = Total_VCtreat/520
aTotalcost = aTAXrev+avTVC
RSalin1 = if (Total_Flow>0) then (Total_Salt*1000/Total_Flow) else 0
TSR = MSRperML*Voltreat
RSalin0 = if (RFlow>0) and (Rsalt>0) then (RSalt*1000/RFlow) else 0
TMS = TMW*Mine_Salinity/1000
Tax_Revenue = taxedSS*tax
```

TaxRev = Tax_Revenue
TVCpML = 100*MSRperML+0.5*MSRperML*(tax-100)
TVCpw = Voltreat*TVCpML
VCtreat = TVCpw
taxrev&TC = TaxRev+VCtreat
aSR = totSR/520
salt_spill = spill*Mine_Salinity/1000
aSD = TSD/520
TSR1 = TSR
Salt_Inflow = Inflow*Mine_Salinity/1000
SD1 = Salt_Discharge

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