APPENDIX M

THREATS ANALYSIS TABLES

Threats Analysis Tables are provided in the following attachments:

Table 6.2.1.1-1	Indiana Bat Threats Analysis Table
Table 6.2.2.1-1	Bog Turtle Threats Analysis Table
Table 6.2.3.1-1	Madison Cave Isopod Threats Analysis Table
Table 6.2.4.1-1	Clubshell Threats Analysis Table
Table 6.2.5.1-1	Northern Riffleshell Threats Analysis Table
Table 6.2.6.1-1	Fanshell Threats Analysis Table
Table 6.2.7.1-1	James Spinymussel Threats Analysis Table
Table 6.2.8.1-1	Sheepnose Threats Analysis Table
Table 6.2.9.1-1	Nashville Crayfish Threats Analysis Table
Table 6.2.10.1-1	American Burying Beetle Threats Analysis Table

Table 6.2.1.1-1 Indiana Bat Threats Analysis Table

Pipeline Activity	Subactivity	Threat	Aggregate/ direct take	Stressor	Direct/ Indirect	Stressor Pathway	Range of Response of Listed Species	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
New Construction	Access Rd Const. - Upgrade Existing Rds - tree clearing	loss of individuals	T	crushing	D	felled tree falls when bats still roosting in it	mortality	Indiana bats	numbers reproduction	breeding sheltering	
New Construction	Access Rds - Perm. - - tree clearing	loss of individuals	T	crushing	D	felled tree falls when bats still roosting in it	mortality	Indiana bats	numbers reproduction	breeding sheltering	
New Construction	Access Rds - Temp. - - tree clearing	loss of individuals	T	crushing	D	felled tree falls when bats still roosting in it	mortality	Indiana bats	numbers reproduction	breeding sheltering	
New Construction	Drilling - Clearing re-established veg.	loss of individuals	T	crushing	D	felled tree falls when bats still roosting in it	mortality	Indiana bats	numbers reproduction	breeding sheltering	
New Construction	Reconditioning - Berms (stormwater control) - tree clearing	loss of individuals	T	crushing	D	felled tree falls when bats still roosting in it	mortality	Indiana bats	numbers reproduction	breeding sheltering	
New Construction	Reconditioning - Berms (stormwater control) - tree clearing	summer roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
New Construction	Tree Clearing (≥ 5 inches DBH)	loss of individuals	T	crushing	D	felled tree falls when bats still roosting in it	mortality	Indiana bats	numbers reproduction	breeding sheltering	
New Construction	Waste Pits - Berms (stormwater control)	loss of individuals	T	entrapment	D	bats get stuck in goop on top of well water and drown	mortality	Indiana bats	numbers reproduction	sheltering	
New Construction	Well Reconditioning - Clearing re-established Veg.	loss of individuals	T	crushing	D	felled tree falls when bats still roosting in it	mortality	Indiana bats	numbers reproduction	breeding sheltering	
New Construction	Well Reconditioning - Clearing re-established Veg.	summer roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	

Pipeline Activity	Subactivity	Threat	Aggregate/ direct take	Stressor	Direct/ Indirect	Stressor Pathway	Range of Response of Listed Species	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
New Construction	Wetland Crossings - Tree Clearing	loss of individuals	T	crushing	D	felled tree falls when bats still roosting in it	mortality	Indiana bats	numbers reproduction	breeding sheltering	
New Construction	Aggregate Sources	increased predation	A	increased raptor perches	I	towers provide raptors with increased predation opportunities	mortality	Indiana bats	numbers	sheltering	
New Disturbance	Access Road Const. - Perm.- tree clearing	spring staging/fall swarming roosting habitat loss (indirect)	T	tree removal	I	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
New Disturbance	Access Road Const. - Temp- tree clearing	spring staging/fall swarming roosting habitat loss (indirect)	T	tree removal	I	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
New Disturbance	Access Road Const. - Upgrade Existing- tree clearing	spring staging/fall swarming roosting habitat loss (indirect)	T	tree removal	I	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
New Disturbance	Tree Clearing	spring staging/fall swarming roosting habitat loss (indirect)	T	tree removal	I	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
New Disturbance	Wetland Crossings - Enhancement/Reconditioning - Clearing Re-established Veg.	spring staging/fall swarming roosting habitat loss (indirect)	T	tree removal	I	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
New Disturbance	Wetland Crossings - Tree Clearing	spring staging/fall swarming roosting habitat loss (indirect)	T	tree removal	I	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
New Disturbance	Access Road Const. - Perm. - tree clearing	summer roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
New Disturbance	Access Road Const. - Perm.- Tree Clearing	spring staging/fall swarming roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
New Disturbance	Access Road Const. - Perm.- tree clearing	summer roosting habitat loss (indirect)	T	tree removal	I	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	

Pipeline Activity	Subactivity	Threat	Aggregate/ direct take	Stressor	Direct/ Indirect	Stressor Pathway	Range of Response of Listed Species	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
New Disturbance	Access Road Const. - Temp. - tree clearing	summer roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
New Disturbance	Access Road Const. - Temp.- Tree Clearing	spring staging/fall swarming roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
New Disturbance	Access Road Const. - Temp.- tree clearing	summer roosting habitat loss (indirect)	T	tree removal	I	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
New Disturbance	Access Road Const. - Upgrade Existing - tree clearing	summer roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
New Disturbance	Access Road Const. - Upgrade Existing- Tree Clearing	spring staging/fall swarming roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
New Disturbance	Access Road Const. - Upgrade Existing- tree clearing	summer roosting habitat loss (indirect)	T	tree removal	I	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
New Disturbance	Aggregate Sources	Loss of individuals	A	chemical contaminants	D	bats get poisoned by contents of waste pit (e.g., brine)	harm - mortality	Indiana bats	numbers reproduction	sheltering	
New Disturbance	Aggregate Sources	Loss of individuals	A	entrapment	D	bats get stuck in goop on top of well water and drown	mortality	Indiana bats	numbers reproduction	sheltering	
New Disturbance	Aggregate Sources	Increased Predation	A	flushing bats	I	activity flushes bats so raptors pursue and/or eat them; also causes bats to find new roost which may be more vulnerable	harm - mortality	Indiana bats	numbers	sheltering	
New Disturbance	Tree Clearing	spring staging/fall swarming roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
New Disturbance	Tree Clearing	summer roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	

Pipeline Activity	Subactivity	Threat	Aggregate/ direct take	Stressor	Direct/ Indirect	Stressor Pathway	Range of Response of Listed Species	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
New Disturbance	Tree Clearing	summer roosting habitat loss (indirect)	T	tree removal	I	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
New Disturbance	Wetland Crossings - Berms	summer roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
New Disturbance	Wetland Crossings - Clearing Re-established Veg.	summer roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
New Disturbance	Wetland Crossings - Enhancement/Reconditioning - Clearing Re-established Veg.	summer roosting habitat loss (indirect)	T	tree removal	I	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
New Disturbance	Wetland Crossings - Enhancement/Reconditioning - Clearing Re-established Veg.- Waste Pits - Berms	summer roosting habitat loss (indirect)	T	tree removal	I	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
New Disturbance	Wetland Crossings - Reconditioning - Clearing Re-established Veg.	spring staging/fall swarming roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
New Disturbance	Wetland Crossings - Reconditioning - Clearing Re-established Veg.	summer roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
New Disturbance	Wetland Crossings - Tree Clearing	spring staging/fall swarming roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
New Disturbance	Wetland Crossings - Tree Clearing	summer roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
New Disturbance	Wetland Crossings - Tree Clearing	summer roosting habitat loss (indirect)	T	tree removal	I	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
O & M	Abandonment - Well - Restoration	summer roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	

Pipeline Activity	Subactivity	Threat	Aggregate/ direct take	Stressor	Direct/ Indirect	Stressor Pathway	Range of Response of Listed Species	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
O & M	Abandonment - Well - Restoration- Tree Clearing	spring staging/fall swarming roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
O & M	Abandonment - Well - Restoration- tree clearing	spring staging/fall swarming roosting habitat loss (indirect)	T	tree removal	I	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
O & M	Abandonment - Well - Restoration- tree clearing	summer roosting habitat loss (indirect)	T	tree removal	I	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
O & M	Access Road Const. - Upgrade Existing - grading	summer roosting habitat loss	T	blocking roost access (mine portals)	D	regrading spoil is pushed in front of mine portal entrances used for summer roosting	harass - harm	mine portal	n/a	sheltering	
O & M	Access Roads - Existing Road Maint. - tree clearing	summer roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
O & M	Access Roads - Existing Road Maint. - tree clearing	summer roosting habitat loss (indirect)	T	tree removal	I	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
O & M	Access Roads - Existing Road Maint.- Tree Clearing	spring staging/fall swarming roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
O & M	Access Roads - Existing Road Maint.- tree clearing	spring staging/fall swarming roosting habitat loss (indirect)	T	tree removal	I	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
O & M	Access Roads - Existing Road Maintenance - - tree clearing	loss of individuals	T	crushing	D	felled tree falls when bats still roosting in it	mortality	Indiana bats	numbers reproduction	breeding sheltering	
O & M	Aggregate Sources	loss of individuals	A	chemical contaminants	D	bats get poisoned by contents of waste pit (e.g., brine)	harm - mortality	Indiana bats	numbers reproduction	sheltering	
O & M	Aggregate Sources	loss of individuals	A	entrapment	D	bats get stuck in goop on top of well water and drown	mortality	Indiana bats	numbers reproduction	sheltering	

Pipeline Activity	Subactivity	Threat	Aggregate/ direct take	Stressor	Direct/ Indirect	Stressor Pathway	Range of Response of Listed Species	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
O & M	Aggregate Sources	increased predation	A	flushing bats	I	activity flushes bats so raptors pursue and/or eat them; also causes bats to find new roost which may be more vulnerable	harm - mortality	Indiana bats	numbers	sheltering	
O & M	Aggregate Sources	increased predation	A	increased raptor perches	I	open corridors (i.e. lack of overstory closure) provides raptors with increased predation opportunities	mortality	Indiana bats	numbers	sheltering	
O & M	Aggregate Sources	loss of individuals	A	in-flight collisions	D	this captures the guy lines - bats are very likely to be able to navigate around, but some take may occur	harm - mortality	Indiana bats	numbers reproduction	sheltering	
O & M	Aggregate Sources	human disturbance to roosting, foraging, & travel corridors in summer, spring staging, & fall swarming habitat	A	noise and activity	D	noise and activity flushes/stresses roosting bats	harass	Indiana bats	reproduction	sheltering breeding	
O & M	Bucket Truck (Tree side trimming)	loss of individuals	T	crushing	D	felled tree falls when bats still roosting in it	mortality	Indiana bats	numbers reproduction	breeding sheltering	
O & M	Chainsaw Felling	loss of individuals	T	crushing	D	felled tree falls when bats still roosting in it	mortality	Indiana bats	numbers reproduction	breeding sheltering	
O & M	GACPC - Off ROW Clearing	spring staging/fall swarming roosting habitat loss (indirect)	T	tree removal	I	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
O & M	GACPC - Off ROW Clearing	summer roosting habitat loss (indirect)	T	tree removal	I	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
O & M	GACPC. - Off ROW Clearing	spring staging/fall swarming roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
O & M	GACPC: Off ROW Clearing - 400-800 ft from ROW	loss of individuals	T	crushing	D	felled tree falls when bats still roosting in it	mortality	Indiana bats	numbers reproduction	breeding sheltering	

Pipeline Activity	Subactivity	Threat	Aggregate/ direct take	Stressor	Direct/ Indirect	Stressor Pathway	Range of Response of Listed Species	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
O & M	GACPC: Off ROW Clearing - 400-800 ft from ROW	summer roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
O & M	General App. And Cath. Protection Const. - Off ROW Clearing	summer roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
O & M	Helicopter tree clearing	loss of individuals	T	crushing	D	felled tree falls when bats still roosting in it	mortality	Indiana bats	numbers reproduction	breeding sheltering	
O & M	Tree Clearing	loss of individuals	T	crushing	D	felled tree falls when bats still roosting in it	mortality	Indiana bats	numbers reproduction	breeding sheltering	
O & M	Tree Side Trimming – Bucket Truck	summer roosting habitat loss (indirect)	T	tree removal	I	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
O & M	Tree Side Trimming – Bucket Truck tree clearing	summer roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
O & M	Tree Side Trimming – Bucket Truck- Tree Clearing	spring staging/fall swarming roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
O & M	Tree Side Trimming – Bucket Truck- tree clearing	spring staging/fall swarming roosting habitat loss (indirect)	T	tree removal	I	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
O & M	Tree Side Trimming – Helicopter	summer roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
O & M	Tree Side Trimming – Helicopter	summer roosting habitat loss (indirect)	T	tree removal	I	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
O & M	Tree Side Trimming – Helicopter- Tree Clearing	spring staging/fall swarming roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	

Pipeline Activity	Subactivity	Threat	Aggregate/ direct take	Stressor	Direct/ Indirect	Stressor Pathway	Range of Response of Listed Species	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
O & M	Tree Side Trimming – Helicopter- tree clearing	spring staging/fall swarming roosting habitat loss (indirect)	T	tree removal	I	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
O & M	Veg. Management - Chainsaw	summer roosting habitat loss (indirect)	T	tree removal	I	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
O & M	Veg. Management - Chainsaw felling	spring staging/fall swarming roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
O & M	Veg. Management - Chainsaw felling	spring staging/fall swarming roosting habitat loss (indirect)	T	tree removal	I	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
O & M	Veg. Management - Chainsaw felling	summer roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
O & M	Veg. Management - Tree Clearing	spring staging/fall swarming roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
O & M	Veg. Management - Tree Clearing	spring staging/fall swarming roosting habitat loss (indirect)	T	tree removal	I	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
O & M	Veg. Management - Tree Clearing	summer roosting habitat loss	T	tree removal	D	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
O & M	Veg. Management - Tree Clearing	summer roosting habitat loss (indirect)	T	tree removal	I	suitable habitat lost & not replaced	harass - harm	Trees > 5 inches dbh	reproduction	breeding sheltering	
O & M	Well Abandonment – Restoration (tree clearing)	loss of individuals	T	crushing	D	felled tree falls when bats still roosting in it	mortality	Indiana bats	numbers reproduction	breeding sheltering	

* standard font indicates mandatory AMM; **bold** and *italics* indicates non-mandatory AMM

Table 6.2.2.1-1 Bog Turtle Threats Analysis Table

Pipeline Activity	Subactivity	Threat	Stressor	Aggregate/ Direct take	Direct/ Indirect	Stressor Pathway	Range of Response	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
O & M	vehicle operation	physical impacts to individuals	crushing	T	D	disturbs nesting and hibernating areas	harm - mortality	individuals	numbers	breeding sheltering	1,2,3,4,*12*
O & M	vegetation management (mowing)	physical impacts to individuals	crushing	T	D	disturbs nesting and hibernating areas	harass - mortality	individuals	numbers	breeding sheltering	1,2,3,4,5,7
O & M	vegetation management (herbicide application)	physical impacts to individuals	chemical contaminants	T	D	hand or vehicle mounted application of herbicides	harass - mortality	individuals	numbers	breeding sheltering	1,3,8
New Disturbance	access road construction	physical impacts to individuals	chemical contaminants	T	D	use of herbicides	harass - mortality	individuals	numbers	breeding sheltering	1,2,3,25,26
New Disturbance	vehicle operation	physical impacts to individuals	crushing	T	D	disturbs nesting and hibernating areas	harm - mortality	individuals	numbers	breeding sheltering	1,2,3,4,*12, 25, 26*
New Disturbance	minor spill event	physical impacts to individuals	chemical contaminants	T	D	spill event kills individuals	harm - mortality	individuals	numbers	breeding sheltering	1,2,3, 23,25,26
New Disturbance	access road construction (temporary)	physical impacts to individuals	crushing	T	D	disturbs nesting and hibernating areas	harm - mortality	individuals	numbers	breeding sheltering	1,2,3, *25, 26*
New Disturbance	access road construction (permanent)	physical impacts to individuals	crushing	T	D	disturbs nesting and hibernating areas	harm - mortality	individuals	numbers	breeding sheltering	1,2,3, *25, 26*
New Disturbance	vegetation management - clearing	temporary or permanent loss of habitat	vegetation removal	T	I	disturbs nesting and hibernating areas	harm	bog turtle habitat	distribution (when loss is permanent)	breeding sheltering	1,2,3, 25, 26
New Disturbance	R-O-W (grading)	temporary or permanent loss of habitat	hydrologic changes	T	I	activities could alter surface water flow	harm	bog turtle habitat	distribution (when loss is permanent)	breeding sheltering	1,2,3, 25, 26
New Disturbance	R-O-W (trenching - digging, blasting, dewatering)	temporary or permanent loss of habitat	hydrologic changes	T	I	activities could alter surface water flow	harm	bog turtle habitat	distribution (when loss is permanent)	breeding sheltering	1,2,3, 25, 26

Pipeline Activity	Subactivity	Threat	Stressor	Aggregate/ Direct take	Direct/ Indirect	Stressor Pathway	Range of Response	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
New Disturbance	access road construction (temporary)	temporary or permanent loss of habitat	habitat loss due to road (vegetation removed, gravel fill)	T	I	road created	harm	bog turtle habitat	distribution (when loss is permanent)	breeding sheltering	1,2,3, 25, 26
New Disturbance	access road construction (permanent)	temporary or permanent loss of habitat	habitat loss due to road (vegetation removed, gravel fill)	T	I	road created	harm	bog turtle habitat	distribution (when loss is permanent)	breeding sheltering	1,2,3, 25, 26
New Disturbance	wetland crossings - clearing	temporary or permanent loss of habitat	vegetation removal	T	I	road created	harm	bog turtle habitat	distribution (when loss is permanent)	breeding sheltering	1,2,3, 25, 26
New Disturbance	wetland crossings - grading	temporary or permanent loss of habitat	hydrologic changes	T	I	activities could alter surface water flow	harm	bog turtle habitat	distribution (when loss is permanent)	breeding sheltering	1,2,3, 25, 26
New Disturbance	wetland crossings - (trenching - digging, blasting, dewatering)	temporary or permanent loss of habitat	hydrologic changes	T	I	activities could alter surface water flow	harm	bog turtle habitat	distribution (when loss is permanent)	breeding sheltering	1,2,3, 25, 26

* standard font indicates mandatory AMM; **bold** and *italics* indicates non-mandatory AMM

Table 6.2.3.1-1 Madison Cave Isopod Threats Analysis Table

Pipeline Activity	Subactivity	Threat	Stressor	Aggregate/ Direct take	Direct/ Indirect	Stressor Pathway	Range of Response	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
New Disturbance	Construction - Trenching (digging)	Physical Impacts to Individuals	crushing	T	D	digging into or near the karst "caves" crushes MCI	mortality	individuals			1, 2, *3*, 4, 5, 14, 15
New Disturbance	Construction - Trenching (blasting)	Physical Impacts to Individuals	crushing	T	D	blasting fractures the rock and causes collapse (or impact) of karst topography	mortality	individuals			1, 2, *3*, 4, 5, 6, 14, 15
New Disturbance	Access Road Construction (temporary)	Physical Impacts to Individuals	crushing	T	D	crushing of karst - sinkholes, fissures, etc	mortality	individuals			1, 2, *3*, 4, 5, 14, 15
New Disturbance	Access Road Construction (permanent)	Physical Impacts to Individuals	crushing	T	D	crushing of karst - sinkholes, fissures, etc	mortality	individuals			1, 2, *3*, 4, 5, 14, 15
New Disturbance	HDD - drilling- **removed as a covered activity within range of MCI**	Physical Impacts to Individuals	smothering	T	D	drilling below the surface affects the aquifer - drilling fluid can get into fractures in karst and smothers	mortality	individuals			1, 2, 3, 4, 5, 7
New Disturbance	Wetland crossings (digging)	Physical Impacts to Individuals	crushing	T	D	digging into or near the karst "caves" crushes MCI	mortality	individuals			1, 2, *3*, 4, 5, 14, 15
New Disturbance	Wetland crossings (blasting)	Physical Impacts to Individuals	crushing	T	D	blasting fractures the rock and causes collapse (or impact) of karst topography	mortality	individuals			1, 2, *3*, 4, 5, 6, 14, 15
New Disturbance	Wetland crossings - HDD drilling- removed as a covered activity within range of MCI	Physical Impacts to Individuals	smothering	T	D	drilling below the surface affects the aquifer - drilling fluid can get into fractures in karst and smothers	mortality	individuals			1, 2, 3, 4, 5, 7
New Disturbance	Minor Spill Event	Physical Impacts to Individuals	chemical contaminants	T	D	exposure poisons isopods	harass - mortality	individuals			1, 2, 3, 4, 5, 9,10,11,12,13,14,18
New Disturbance	HDD - drilling- **removed as a covered activity within range of MCI**	Physical Impacts to Individuals	chemical contaminants	T	D	drilling below the surface affects the aquifer - drilling fluid can get into fractures in karst and poisons	harass - mortality	individuals			1, 2, 3, 4, 5, 7

Pipeline Activity	Subactivity	Threat	Stressor	Aggregate/ Direct take	Direct/ Indirect	Stressor Pathway	Range of Response	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
O & M	Pipeline Abandonment	Physical Impacts to Individuals	crushing	T	D	equipment can cause crushing	mortality	individuals			1, 2, *3*, 4, 5, 14, 15
O & M	Pipeline Abandonment	Habitat degradation	sedimentation	T	I	activity disturbs the ground	harass - mortality	individuals			1, 2, *3*, 4, 5, 14
New Disturbance	Construction - grading	Physical Impacts to Individuals	smothering	T	D	grading near the karst "caves" crushes MCI	mortality	individuals			1, 2, *3*, 4, 5, 14,18
New Disturbance	Construction - grading	Habitat degradation	sedimentation	T	I	activity disturbs the ground	harass - mortality	individuals			1, 2, *3*, 4, 5, 14,18
New Disturbance	Construction - Trenching (digging)	Habitat degradation	sedimentation	T	I	digging into or near the karst "caves" causes ground disturbance	harass - harm	individuals			1, 2, *3*, 4, 5, 14,18
New Disturbance	Construction - Trenching (blasting)	Habitat degradation	sedimentation	T	I	blasting fractures the rock and causes ground disturbance	harass - harm	individuals			1, 2, *3*, 4, 5, 6, 14,18
New Disturbance	Access Road Construction (temporary)	Habitat Loss	filling of karst features	T	I	fissures or openings may be missed and then filled	harass - harm	individuals			1, 2, 3, 4, 5, 14,18
New Disturbance	Access Road Construction (permanent)	Habitat Loss	filling of karst features	T	I	fissures or openings may be missed and then filled	harass - harm	individuals			1, 2, 3, 4, 5, 14,18

Pipeline Activity	Subactivity	Threat	Stressor	Aggregate/ Direct take	Direct/ Indirect	Stressor Pathway	Range of Response	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
New Disturbance	HDD - drilling- **removed as a covered activity within range of MCI**	Habitat Loss	filling of karst features	T	I	drilling below the surface affects the aquifer - drilling fluid can get into fractures in karst and poisons	harass - mortality	individuals			1, 2, 3, 4, 5, 7
New Disturbance	Wetland crossings (digging)	Habitat degradation	sedimentation	T	I	digging into or near the karst "caves" causes ground disturbance	harass - harm	individuals			1, 2, *3*, 4, 5, 14,18
New Disturbance	Wetland crossings (blasting)	Habitat degradation	sedimentation	T	I	blasting fractures the rock and causes ground disturbance	harass - harm	individuals			1, 2, *3*, 4, 5, 6, 14,18
New Disturbance	Access Road Construction (temporary)	Habitat degradation	hydrologic impacts	T	I	road presence may create impervious surface through compaction; reduces ability of water to percolate down to water table	harass - harm	individuals			1, 2, *3*, 4, 5, 14,18
New Disturbance	Access Road Construction (permanent)	Habitat degradation	hydrologic impacts	T	I	road presence may create impervious surface through paving and compaction; reduces ability of water to percolate down to water table	harass - harm	individuals			1, 2, *3*, 4, 5, 14,18

* standard font indicates mandatory AMM; **bold** and *italics* indicates non-mandatory AMM

Table 6.2.4.1-1 Clubshell Threats Analysis Table

Pipeline Activity	Subactivity	Threat	Stressor	Aggregate/ direct take	Direct/ Indirect	Stressor Pathway	Range of Response	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
New Disturbance	aggregate source	habitat degradation	increase in water temperature	A	I	vegetation no longer shades stream - stresses mussels - low dissolved oxygen	harass	clubshell streams & riparian area	n/a	feeding sheltering	2
New Disturbance	aggregate source	loss and degradation of clubshell & host fish habitat	chemical contaminants	A	D/I	algae blooms	reduced feeding, breeding success (harm) - reduced recruitment (harm)	clubshell forage base, clubshell streams, host fish habitat	reproduction	breeding feeding sheltering	2, 16, ECS
New Disturbance	aggregate source	loss of host fish	chemical contaminants	A	I	host fish die, as well as attached glochidia	reduced recruitment (harm) - mortality	host fish & glochidia	reproduction	breeding	2, 13, 15
New Disturbance	aggregate source	loss of host fish	sedimentation	A	I	host fish die, as well as attached glochidia	reduced recruitment (harm) - mortality	host fish & glochidia	reproduction	breeding	2, ECS
New Disturbance	aggregate source	physical impacts to individuals	chemical contaminants	A	D/I	herbicides/ diesel fuel/ etc, in high levels & impact forage matter for mussels	decreased feeding success - mortality	clubshell mussels & plankton	numbers reproduction	breeding feeding sheltering	2, 13, 15
New Disturbance	access road construction - permanent & temporary	physical impacts to individuals	crushing	T	D	stream crossing - equipment crushes individual mussels	mortality	clubshell mussels	numbers reproduction	breeding feeding sheltering	2, **9,** 10

Pipeline Activity	Subactivity	Threat	Stressor	Aggregate/ direct take	Direct/ Indirect	Stressor Pathway	Range of Response	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
New Disturbance	instream stabilization - ROW-RRR	physical impacts to individuals	crushing	T	D	mussels crushed through equipment and placement of fill material	mortality	clubshell mussels	numbers reproduction	breeding feeding sheltering	2, 5
New Disturbance	restoration (instream stabilization)	physical impacts to individuals	crushing	T	D	equipment crushes individuals	harm - mortality	clubshell mussels	numbers reproduction	breeding feeding sheltering	2, 5
New Disturbance	stream crossings - wet ditch (excavation)	physical impacts to individuals	crushing	T	D	mussels crushed through equipment and placement of fill material	mortality	clubshell mussels	numbers reproduction	breeding feeding sheltering	2, 4, ***9,*** 10
New Disturbance	vegetation disposal	physical impacts to individuals	crushing	T	D	mussels crushed as vegetative matter is hauled across stream for disposal	harm - mortality	clubshell mussels	numbers reproduction distribution	breeding feeding sheltering	***19***
New Disturbance	aggregate source	physical impacts to individuals	entrapment	A	D	water testing sucks mussels into intake pipe	mortality	juvenile clubshell mussels and glochidia attached to host fish	numbers reproduction	breeding feeding sheltering	2***, 17***, 18

Pipeline Activity	Subactivity	Threat	Stressor	Aggregate/ direct take	Direct/ Indirect	Stressor Pathway	Range of Response	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
New Disturbance	aggregate source	physical impacts to individuals	introduction of invasive species	A	D	zebra mussels choke native mussels	reduced feeding, breeding - displacement - mortality	clubshell mussels	numbers reproduction distribution	breeding feeding sheltering	2, 18, ***17***
O & M	aggregate source	habitat degradation	altered flow	A	I	pipeline in stream becomes exposed over time, resulting in scour, sedimentation, etc.	reduced feeding, breeding - displacement - mortality	clubshell streams, clubshell mussels, host fish	numbers reproduction distribution	breeding feeding sheltering	2, 4, 8
O & M	aggregate source	habitat degradation	sedimentation	A	D/I	denuding bank - grubbing with heavy equipment - disturbing soil- upland and wetland areas - tributary and/or near stream earth disturbance - sedimentation in water column and on stream bed, as well as degradation downstream	harm - mortality	clubshell mussels, clubshell streams	numbers reproduction distribution	breeding feeding sheltering	
O & M	aggregate source	loss and degradation of host fish habitat	sedimentation	A	I	tributary and/or near stream earth disturbance - sedimentation in water column and on stream bed	reduced recruitment (harm)	host fish habitat riparian area	reproduction	breeding	2

Pipeline Activity	Subactivity	Threat	Stressor	Aggregate/ direct take	Direct/ Indirect	Stressor Pathway	Range of Response	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
O & M	aggregate source	permanent or temporary loss of occupied habitat	altered flow	A	D/I	loss due to relocation of small segments of the channel	Multi-generational reduced sheltering opportunities (harm - mortality)	clubshell mussels, clubshell streams	numbers reproduction distribution	breeding feeding sheltering	5
O & M	aggregate source	physical impacts to individuals	altered flow	A	I	change in food availability or host fish habitat - scour mussels out	reduced feeding, breeding - displacement - mortality	clubshell streams, clubshell mussels	numbers reproduction distribution	breeding feeding sheltering	2, 4, 8
O & M	aggregate source	physical impacts to individuals	crushing	A	D	mussels crushed due to infrequent and unpredictable vehicles crossing stream	harm - mortality	clubshell mussels	numbers reproduction distribution	breeding feeding sheltering	***19***
O & M	Instream stabilization - ROW-RRR	physical impacts to individuals	crushing	T	D	mussels crushed through equipment and placement of fill material	mortality	clubshell mussels	numbers reproduction	breeding feeding sheltering	2, 5, ***6,*** 7
O & M	Pipeline Abandonment (removal)	physical impacts to individuals	crushing	T	D	mussels crushed through equipment and placement of fill material	mortality	clubshell mussels	numbers reproduction	breeding feeding sheltering	2, ***6***, 7, ***9,*** 10, ***12***

* standard font indicates mandatory AMM; **bold** and *italics* indicates non-mandatory AMM

Table 6.2.5.1-1 Northern Riffleshell Threats Analysis Table

Pipeline Activity	Subactivity	Threat	Stressor	Aggregate/ direct take	Direct/ Indirect	Stressor Pathway	Range of Response	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
New Disturbance	aggregate source	habitat degradation	increase in water temperature	A	I	vegetation no longer shades stream - stresses mussels - low dissolved oxygen	harass	N.Riffleshell streams & riparian area	n/a	feeding sheltering	2
New Disturbance	aggregate source	loss and degradation of N. Riffleshell & host fish habitat	chemical contaminants	A	D/I	algae blooms	reduced feeding, breeding success (harm) - reduced recruitment (harm)	N.Riffleshell forage base, N.Riffleshell streams, host fish habitat	reproduction	breeding feeding sheltering	2, 16, ECS
New Disturbance	aggregate source	loss of host fish	chemical contaminants	A	I	host fish die, as well as attached glochidia	reduced recruitment (harm) - mortality	host fish & glochidia	reproduction	breeding	2, 13, 15
New Disturbance	aggregate source	loss of host fish	sedimentation	A	I	host fish die, as well as attached glochidia	reduced recruitment (harm) - mortality	host fish & glochidia	reproduction	breeding	2, ECS
New Disturbance	aggregate source	physical impacts to individuals	chemical contaminants	A	D/I	herbicides/ diesel fuel/ etc, in high levels & impact forage matter for mussels	decreased feeding success - mortality	N.Riffleshell mussels & plankton	numbers reproduction	breeding feeding sheltering	2, 13, 15
New Disturbance	restoration (instream stabilization)	physical impacts to individuals	crushing	T	D	equipment crushes individuals	harm - mortality	N.Riffleshell mussels	numbers reproduction	breeding feeding sheltering	2, 5
New Disturbance	access road construction - permanent & temporary	physical impacts to individuals	crushing	T	D	stream crossing - equipment crushes individual mussels	mortality	N.Riffleshell mussels	numbers reproduction	breeding feeding sheltering	2, **9,** 10
New Disturbance	instream stabilization - ROW-RRR	physical impacts to individuals	crushing	T	D	mussels crushed through equipment and placement of fill material	mortality	N.Riffleshell mussels	numbers reproduction	breeding feeding sheltering	2, 5
New Disturbance	stream crossings - wet ditch (excavation)	physical impacts to individuals	crushing	T	D	mussels crushed through equipment and placement of fill material	mortality	N.Riffleshell mussels	numbers reproduction	breeding feeding sheltering	2, 4, **9,** 10

Pipeline Activity	Subactivity	Threat	Stressor	Aggregate/ direct take	Direct/ Indirect	Stressor Pathway	Range of Response	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
New Disturbance	vegetation disposal	physical impacts to individuals	crushing	T	D	mussels crushed as vegetative matter is hauled across stream for disposal	harm - mortality	N.Riffleshell mussels	numbers reproduction distribution	breeding feeding sheltering	***19***
New Disturbance	aggregate source	physical impacts to individuals	entrapment	A	D	water testing sucks mussels into intake pipe	mortality	juvenile N.Riffleshell mussels and glochidia attached to host fish	numbers reproduction	breeding feeding sheltering	2***, 17***, 18
New Disturbance	aggregate source	physical impacts to individuals	introduction of invasive species	A	D	zebra mussels choke native mussels	reduced feeding, breeding - displacement - mortality	N.Riffleshell mussels	numbers reproduction distribution	breeding feeding sheltering	2, 18, ***17***
O & M	aggregate source	habitat degradation	altered flow	A	I	pipeline in stream becomes exposed over time, resulting in scour, sedimentation, etc.	reduced feeding, breeding - displacement - mortality	N.Riffleshell streams, N.Riffleshell mussels, host fish	numbers reproduction distribution	breeding feeding sheltering	2, 4, 8
O & M	aggregate source	habitat degradation	sedimentation	A	D/I	denuding bank - grubbing with heavy equipment - disturbing soil- upland and wetland areas - tributary and/or near stream earth disturbance - sedimentation in water column and on stream bed, as well as degradation downstream	harm - mortality	N.Riffleshell mussels, N.Riffleshell streams	numbers reproduction distribution	breeding feeding sheltering	
O & M	aggregate source	loss and degradation of host fish habitat	sedimentation	A	I	tributary and/or near stream earth disturbance - sedimentation in water column and on stream bed	reduced recruitment (harm)	host fish habitat riparian area	reproduction	breeding	2

Pipeline Activity	Subactivity	Threat	Stressor	Aggregate/ direct take	Direct/ Indirect	Stressor Pathway	Range of Response	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
O & M	aggregate source	permanent or temporary loss of occupied habitat	altered flow	A	D/I	loss due to relocation of small segments of the channel	Multi-generational reduced sheltering opportunities (harm - mortality)	N.Riffleshell mussels, N.Riffleshell streams	numbers reproduction distribution	breeding feeding sheltering	5
O & M	aggregate source	physical impacts to individuals	altered flow	A	I	change in food availability or host fish habitat - scour mussels out	reduced feeding, breeding - displacement - mortality	N.Riffleshell streams, N.Riffleshell mussels	numbers reproduction distribution	breeding feeding sheltering	2, 4, 8
O & M	aggregate source	physical impacts to individuals	crushing	A	D	mussels crushed due to infrequent and unpredictable vehicles crossing stream	harm - mortality	N.Riffleshell mussels	numbers reproduction distribution	breeding feeding sheltering	***19***
O & M	instream stabilization - ROW-RRR	physical impacts to individuals	crushing	T	D	mussels crushed through equipment and placement of fill material	mortality	N.Riffleshell mussels	numbers reproduction	breeding feeding sheltering	2, 5, ***6,*** 7
O & M	pipeline abandonment (removal)	physical impacts to individuals	crushing	T	D	mussels crushed through equipment and placement of fill material	mortality	N.Riffleshell mussels	numbers reproduction	breeding feeding sheltering	2, ***6***, 7, ***9,*** 10, ***12***

* standard font indicates mandatory AMM; **bold** and *italics* indicates non-mandatory AMM

Table 6.2.6.1-1 Fanshell Threats Analysis Table

Pipeline Activity	Subactivity	Threat	Stressor	Aggregate/ direct take	Direct/ Indirect	Stressor Pathway	Range of Response	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
New Disturbance	aggregate source	habitat degradation	increase in water temperature	A	I	vegetation no longer shades stream - stresses mussels - low dissolved oxygen	harass	fanshell streams & riparian area	n/a	feeding sheltering	2
New Disturbance	aggregate source	loss and degradation of fanshell & host fish habitat	chemical contaminants	A	D/I	algae blooms	reduced feeding, breeding success (harm) - reduced recruitment (harm)	fanshell forage base, fanshell streams, host fish habitat	reproduction	breeding feeding sheltering	2, 16, ECS
New Disturbance	aggregate source	loss of host fish	chemical contaminants	A	I	host fish die, as well as attached glochidia	reduced recruitment (harm) - mortality	host fish & glochidia	reproduction	breeding	2, 13, 15
New Disturbance	aggregate source	loss of host fish	sedimentation	A	I	host fish die, as well as attached glochidia	reduced recruitment (harm) - mortality	host fish & glochidia	reproduction	breeding	2, ECS
New Disturbance	aggregate source	physical impacts to individuals	chemical contaminants	A	D/I	herbicides/ diesel fuel/ etc, in high levels & impact forage matter for mussels	decreased feeding success - mortality	fanshell mussels & plankton	numbers reproduction	breeding feeding sheltering	2, 13, 15
New Disturbance	restoration (instream stabilization)	physical impacts to individuals	crushing	T	D	equipment crushes individuals	harm - mortality	fanshell mussels	numbers reproduction	breeding feeding sheltering	2, 5
New Disturbance	access road construction - permanent & temporary	physical impacts to individuals	crushing	T	D	stream crossing - equipment crushes individual mussels	mortality	fanshell mussels	numbers reproduction	breeding feeding sheltering	2, ***9,*** 10
New Disturbance	instream stabilization - ROW-RRR	physical impacts to individuals	crushing	T	D	mussels crushed through equipment and placement of fill material	mortality	fanshell mussels	numbers reproduction	breeding feeding sheltering	2, 5
New Disturbance	stream crossings - wet ditch (excavation)	physical impacts to individuals	crushing	T	D	mussels crushed through equipment and placement of fill material	mortality	fanshell mussels	numbers reproduction	breeding feeding sheltering	2, 4, ***9,*** 10

Pipeline Activity	Subactivity	Threat	Stressor	Aggregate/ direct take	Direct/ Indirect	Stressor Pathway	Range of Response	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
New Disturbance	vegetation disposal	physical impacts to individuals	crushing	T	D	mussels crushed as vegetative matter is hauled across stream for disposal	harm - mortality	fanshell mussels	numbers reproduction distribution	breeding feeding sheltering	***19***
New Disturbance	aggregate source	physical impacts to individuals	entrapment	A	D	water testing sucks mussels into intake pipe	mortality	juvenile fanshell mussels and glochidia attached to host fish	numbers reproduction	breeding feeding sheltering	2***, 17***, 18
New Disturbance	aggregate source	physical impacts to individuals	introduction of invasive species	A	D	zebra mussels choke native mussels	reduced feeding, breeding - displacement - mortality	fanshell mussels	numbers reproduction distribution	breeding feeding sheltering	2, 18, ***17***
O & M	aggregate source	habitat degradation	altered flow	A	I	pipeline in stream becomes exposed over time, resulting in scour, sedimentation, etc.	reduced feeding, breeding - displacement - mortality	fanshell streams, fanshell mussels, host fish	numbers reproduction distribution	breeding feeding sheltering	2, 4, 8
O & M	aggregate source	habitat degradation	sedimentation	A	D/I	denuding bank - grubbing with heavy equipment - disturbing soil- upland and wetland areas -tributary and/or near stream earth disturbance - sedimentation in water column and on stream bed, as well as degradation downstream	harm - mortality	fanshell mussels, fanshell streams	numbers reproduction distribution	breeding feeding sheltering	
O & M	aggregate source	loss and degradation of host fish habitat	sedimentation	A	I	tributary and/or near stream earth disturbance - sedimentation in water column and on stream bed	reduced recruitment (harm)	host fish habitat riparian area	reproduction	breeding	2

Pipeline Activity	Subactivity	Threat	Stressor	Aggregate/ direct take	Direct/ Indirect	Stressor Pathway	Range of Response	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
O & M	aggregate source	permanent or temporary loss of occupied habitat	altered flow	A	D/I	loss due to relocation of small segments of the channel	Multi-generational reduced sheltering opportunities (harm - mortality)	fanshell mussels, fanshell streams	numbers reproduction distribution	breeding feeding sheltering	5
O & M	aggregate source	physical impacts to individuals	altered flow	A	I	change in food availability or host fish habitat - scour mussels out	reduced feeding, breeding - displacement - mortality	fanshell streams, fanshell mussels	numbers reproduction distribution	breeding feeding sheltering	2, 4, 8
O & M	aggregate source	physical impacts to individuals	crushing	A	D	mussels crushed due to infrequent and unpredictable vehicles crossing stream	harm - mortality	fanshell mussels	numbers reproduction distribution	breeding feeding sheltering	***19***
O & M	instream stabilization - ROW-RRR	physical impacts to individuals	crushing	T	D	mussels crushed through equipment and placement of fill material	mortality	fanshell mussels	numbers reproduction	breeding feeding sheltering	2, 5, ***6,*** 7
O & M	pipeline abandonment (removal)	physical impacts to individuals	crushing	T	D	mussels crushed through equipment and placement of fill material	mortality	fanshell mussels	numbers reproduction	breeding feeding sheltering	2, ***6***, 7, ***9,*** 10, ***12***

* standard font indicates mandatory AMM; **bold** and *italics* indicates non-mandatory AMM

Table 6.2.7.1-1 James Spinymussel Threats Analysis Table

Pipeline Activity	Subactivity	Threat	Stressor	Aggregate/ direct take	Direct/ Indirect	Stressor Pathway	Range of Response of listed species	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
O & M	aggregate source	habitat degradation	altered flow	A	I	stream channel width changes increase velocity - decreased food availability - pipeline in stream becomes exposed over time, resulting in scour, sedimentation, etc.	reduced feeding, breeding - displacement - mortality	James spinymussel streams, James spinymussels, host fish	numbers reproduction distribution	breeding feeding sheltering	2, 4, 5, 8
New Disturbance	aggregate source	habitat degradation	chemical contaminants	A	D/I	algae blooms	reduced feeding, breeding success (harm)	James spinymussel forage base, James spinymussel streams	reproduction	breeding feeding sheltering	2, 16, ECS
New Disturbance	aggregate source	habitat degradation	increase in water temperature	A	I	vegetation no longer shades stream - stresses poor mussels - low dissolved oxygen	harass	James spinymussel streams & riparian area	n/a	feeding sheltering	2
New Disturbance	aggregate source	habitat degradation	sedimentation	A	D/I	sedimentation reduces suitability of habitat - tributary and/or near stream earth disturbance - sedimentation in water column and on stream bed	harass - mortality	James spinymussel streams	numbers reproduction	breeding feeding sheltering	2
O & M	aggregate source	habitat degradation	sedimentation	A	D/I	hard points, altered flow result in sedimentation in water column and on stream bed - tributary and/or near stream earth disturbance - sedimentation in water column and on stream bed	harass - harm	James spinymussel streams & riparian area	reproduction	breeding feeding sheltering	2, 5, 8

Pipeline Activity	Subactivity	Threat	Stressor	Aggregate/ direct take	Direct/ Indirect	Stressor Pathway	Range of Response of listed species	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
O & M	vegetation management (tree clearing ≥ 5 inches)	habitat degradation	sedimentation	A	D/I	denuding bank - grubbing with heavy equipment - disturbing soil	harm - harass	James spinymussels, James spinymussel stream riparian areas	numbers reproduction	breeding feeding sheltering	2
New Disturbance	aggregate source	loss and degradation of host fish habitat	chemical contaminants	A	I	algae blooms	reduced recruitment (harm)	host fish habitat	reproduction	breeding	2, ECS
O & M	aggregate source	loss and degradation of host fish habitat	sedimentation	A	I	tributary and/or near stream earth disturbance - sedimentation in water column and on stream bed	reduced recruitment (harm)	host fish habitat riparian area	reproduction	breeding	2
New Disturbance	aggregate source	loss and degradation of host fish habitat	sedimentation	A	I	host fish leave so fewer opps for glochidia to attach to gills	reduced recruitment (harm)	host fish habitat	reproduction	breeding	2
O & M	aggregate source	loss and degradation of host fish habitat	substrate compaction	A	I	host fish leave so fewer opps for glochidia to attach to gills	reduced recruitment (harm)	host fish habitat	reproduction	breeding	***19***
New Disturbance	aggregate source	loss of host fish	chemical contaminants	A	I	host fish die, as well as attached glochidia	reduced recruitment (harm) - mortality	host fish & glochidia	reproduction	breeding	2, 13, 15
New Disturbance	aggregate source	loss of host fish	entrapment	A	I	host fish die, as well as attached glochidia	reduced recruitment (harm) - mortality	host fish & glochidia	reproduction	breeding	2, ***17***, 18
New Disturbance	aggregate source	loss of host fish	sedimentation	A	I	host fish die, as well as attached glochidia	reduced recruitment (harm) - mortality	host fish & glochidia	reproduction	breeding	2, 3
New Disturbance	aggregate source	loss or degradation of host fish habitat	increase in water temperature	A	I	vegetation no longer shades stream - stresses mussels - low dissolved oxygen	fish swim away so no opportunity for glochidia to attach	host fish & glochidia	reproduction	breeding	2

Pipeline Activity	Subactivity	Threat	Stressor	Aggregate/ direct take	Direct/ Indirect	Stressor Pathway	Range of Response of listed species	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
O & M	aggregate source	permanent or temporary loss of occupied habitat	altered flow	A	D/I	loss due to relocation of small segments of the channel	Multi-generational reduced sheltering opportunities (harm - mortality)	James spinymussels, James spinymussel streams	numbers reproduction distribution	breeding feeding sheltering	5
New Disturbance	aggregate source	permanent or temporary loss of occupied habitat	increase in water temperature	A	I	vegetation no longer shades stream - stresses mussels - low dissolved oxygen	harm - harass	James spinymussel streams & riparian area	reproduction	breeding feeding sheltering	2
New Disturbance	aggregate source	physical impacts to individuals	altered flow	A	I	dewatering strands mussels	harm - harass	James spinymussel	reproduction	breeding	2
O & M	aggregate source	physical impacts to individuals	altered flow	A	I	change in food availability or host fish habitat - scour mussels out	reduced feeding, breeding - displacement - mortality	James spinymussel streams, James spinymussels	numbers reproduction distribution	breeding feeding sheltering	2, 4, 8
New Disturbance	aggregate source	physical impacts to individuals	chemical contaminants	A	D/I	herbicides/ diesel fuel/ etc, in high levels	harm - mortality	James spinymussels	numbers reproduction	breeding feeding sheltering	2, 13, 15
O & M	aggregate source	physical impacts to individuals	crushing	A	D	mussels crushed due to infrequent and unpredictable vehicles crossing stream	harm - mortality	James spinymussels	numbers reproduction distribution	breeding feeding sheltering	***19***
O & M	aggregate source	physical impacts to individuals	increase in water temperature	A	I	vegetation no longer shades stream - stresses poor mussels - low dissolved oxygen	harass	James spinymussel streams & riparian area	n/a	feeding sheltering	8
New Disturbance	aggregate source	physical impacts to individuals	Sedimentation	A	D/I	smothering of mussels	harm - mortality	James spinymussels	numbers reproduction	breeding	2, 3

Pipeline Activity	Subactivity	Threat	Stressor	Aggregate/ direct take	Direct/ Indirect	Stressor Pathway	Range of Response of listed species	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
O & M	aggregate source	physical impacts to individuals	sedimentation	A	I	pipeline in stream becomes exposed over time, resulting in scour, sedimentation, etc.	reduced feeding, breeding - displacement - mortality	James spinymussel streams, James spinymussels	numbers reproduction distribution	breeding feeding sheltering	2, 4, 8
New Disturbance	dry ditch (dam and pump installation/removal/operation)	physical impacts to individuals	altered flow	A	D	dewatering strands mussels	harm - mortality	James spinymussel	reproduction	breeding	2
O & M	instream stabilization - ROW-RRR	physical impacts to individuals	altered flow	T	I	"hard points" - change in food availability or host fish habitat - scour mussels out	reduced feeding, breeding - displacement - mortality	James spinymussel streams, James spinymussels, host fish	numbers reproduction distribution	breeding feeding sheltering	5
New Disturbance	access road construction - permanent & temporary	physical impacts to individuals	crushing	T	D	mussels crushed through equipment and placement of fill material	harm - mortality	James spinymussels	numbers reproduction distribution	breeding feeding sheltering	2, ***9,*** 10
O & M	instream stabilization - ROW-RRR	physical impacts to individuals	crushing	T	D	mussels crushed through equipment and placement of fill material	harm - mortality	James spinymussels	numbers reproduction distribution	breeding feeding sheltering	2, 5, ***6,*** 7
O & M	pipeline abandonment (removal)	physical impacts to individuals	crushing	T	D	mussels crushed through equipment and placement of fill material	harm - mortality	James spinymussels	numbers reproduction distribution	breeding feeding sheltering	2, ***6***, 7, ***9,*** 10, ***12***
New Disturbance	restoration (instream stabilization - dam and culvert)	physical impacts to individuals	crushing	T	D	mussels crushed through equipment and placement of fill material	harm - mortality	James spinymussels	numbers reproduction distribution	breeding feeding sheltering	2, 5

Pipeline Activity	Subactivity	Threat	Stressor	Aggregate/ direct take	Direct/ Indirect	Stressor Pathway	Range of Response of listed species	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
New Disturbance	restoration (instream stabilization - dam and pump)	physical impacts to individuals	crushing	T	D	mussels crushed through equipment and placement of fill material	harm - mortality	James spinymussels	numbers reproduction distribution	breeding feeding sheltering	2, 5
New Disturbance	vegetation disposal	physical impacts to individuals	crushing	T	D	mussels crushed as vegetative matter is hauled across stream for disposal	harm - mortality	James spinymussels	numbers reproduction distribution	breeding feeding sheltering	***19***

* standard font indicates mandatory AMM; **bold** and *italics* indicates non-mandatory AMM

Table 6.2.8.1-1 Sheepnose Threats Analysis Table

Pipeline Activity	Subactivity	Threat	Stressor	Aggregate/ direct take	Direct/ Indirect	Stressor Pathway	Range of Response	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
New Disturbance	aggregate source	habitat degradation	increase in water temperature	A	I	vegetation no longer shades stream - stresses mussels - low dissolved oxygen	harass	sheepnose streams & riparian area	n/a	feeding sheltering	2
New Disturbance	aggregate source	loss and degradation of sheepnose & host fish habitat	chemical contaminants	A	D/I	algae blooms	reduced feeding, breeding success (harm) - reduced recruitment (harm)	sheepnose forage base, sheepnose streams, host fish habitat	reproduction	breeding feeding sheltering	2, 16, ECS
New Disturbance	aggregate source	loss of host fish	chemical contaminants	A	I	host fish die, as well as attached glochidia	reduced recruitment (harm) - mortality	host fish & glochidia	reproduction	breeding	2, 13, 15
New Disturbance	aggregate source	loss of host fish	sedimentation	A	I	host fish die, as well as attached glochidia	reduced recruitment (harm) - mortality	host fish & glochidia	reproduction	breeding	2, ECS
New Disturbance	aggregate source	physical impacts to individuals	chemical contaminants	A	D/I	herbicides/ diesel fuel/ etc, in high levels & impact forage matter for mussels	decreased feeding success - mortality	sheepnose mussels & plankton	numbers reproduction	breeding feeding sheltering	2, 13, 15
New Disturbance	restoration (instream stabilization)	physical impacts to individuals	crushing	T	D	equipment crushes individuals	harm - mortality	sheepnose mussels	numbers reproduction	breeding feeding sheltering	2, 5
New Disturbance	access road construction - permanent & temporary	physical impacts to individuals	crushing	T	D	stream crossing - equipment crushes individual mussels	mortality	sheepnose mussels	numbers reproduction	breeding feeding sheltering	2, ***9,*** 10
New Disturbance	instream stabilization - ROW-RRR	physical impacts to individuals	crushing	T	D	mussels crushed through equipment and placement of fill material	mortality	sheepnose mussels	numbers reproduction	breeding feeding sheltering	2, 5
New Disturbance	stream crossings - wet ditch (excavation)	physical impacts to individuals	crushing	T	D	mussels crushed through equipment and placement of fill material	mortality	sheepnose mussels	numbers reproduction	breeding feeding sheltering	2, 4, ***9,*** 10
New Disturbance	vegetation disposal	physical impacts to individuals	crushing	T	D	mussels crushed as vegetative matter is hauled across stream for disposal	harm - mortality	sheepnose mussels	numbers reproduction distribution	breeding feeding sheltering	***19***
New Disturbance	aggregate source	physical impacts to individuals	entrapment	A	D	water testing sucks mussels into intake pipe	mortality	juvenile sheepnose mussels and glochidia attached to host fish	numbers reproduction	breeding feeding sheltering	2***, 17***, 18

Pipeline Activity	Subactivity	Threat	Stressor	Aggregate/ direct take	Direct/ Indirect	Stressor Pathway	Range of Response	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
New Disturbance	aggregate source	physical impacts to individuals	introduction of invasive species	A	D	zebra mussels choke native mussels	reduced feeding, breeding - displacement - mortality	sheepnose mussels	numbers reproduction distribution	breeding feeding sheltering	2, 18, ***17***
O & M	aggregate source	habitat degradation	altered flow	A	I	pipeline in stream becomes exposed over time, resulting in scour, sedimentation, etc.	reduced feeding, breeding - displacement - mortality	sheepnose streams, sheepnose mussels, host fish	numbers reproduction distribution	breeding feeding sheltering	2, 4, 8
O & M	aggregate source	habitat degradation	sedimentation	A	D/I	denuding bank - grubbing with heavy equipment - disturbing soil- upland and wetland areas -tributary and/or near stream earth disturbance - sedimentation in water column and on stream bed, as well as degradation downstream	harm - mortality	sheepnose mussels, sheepnose streams	numbers reproduction distribution	breeding feeding sheltering	
O & M	aggregate source	loss and degradation of host fish habitat	sedimentation	A	I	tributary and/or near stream earth disturbance - sedimentation in water column and on stream bed	reduced recruitment (harm)	host fish habitat riparian area	reproduction	breeding	2
O & M	aggregate source	permanent or temporary loss of occupied habitat	altered flow	A	D/I	loss due to relocation of small segments of the channel	Multi-generational reduced sheltering opportunities (harm - mortality)	sheepnose mussels, sheepnose streams	numbers reproduction distribution	breeding feeding sheltering	5
O & M	aggregate source	physical impacts to individuals	altered flow	A	I	change in food availability or host fish habitat - scour mussels out	reduced feeding, breeding - displacement - mortality	sheepnose streams, sheepnose mussels	numbers reproduction distribution	breeding feeding sheltering	2, 4, 8
O & M	aggregate source	physical impacts to individuals	crushing	A	D	mussels crushed due to infrequent and unpredictable vehicles crossing stream	harm - mortality	sheepnose mussels	numbers reproduction distribution	breeding feeding sheltering	***19***

Pipeline Activity	Subactivity	Threat	Stressor	Aggregate/ direct take	Direct/ Indirect	Stressor Pathway	Range of Response	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
O & M	instream stabilization - ROW-RRR	physical impacts to individuals	crushing	T	D	mussels crushed through equipment and placement of fill material	mortality	sheepnose mussels	numbers reproduction	breeding feeding sheltering	2, 5, ***6,*** 7
O & M	pipeline abandonment (removal)	physical impacts to individuals	crushing	T	D	mussels crushed through equipment and placement of fill material	mortality	sheepnose mussels	numbers reproduction	breeding feeding sheltering	2, ***6***, 7, ***9,*** 10, ***12***

* standard font indicates mandatory AMM; **bold** and *italics* indicates non-mandatory AMM

Table 6.2.9.1-1 Nashville Crayfish Threats Analysis Table

Pipeline Activity	Subactivity	Threat	Stressor	Aggregate/ direct take	Direct/ Indirect	Stressor Pathway	Range of Response	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
New Disturbance	aggregate sources	habitat degradation	altered flow	A	I	dewatering strands crayfish	harm - harass	Nashville crayfish	reproduction	breeding feeding sheltering	3, ***10***
O & M	aggregate sources	habitat degradation	altered flow	A	I	pipeline in stream becomes exposed over time, resulting in scour, sedimentation, etc. - "hard points" scour crayfish out.	harm - harass	Nashville crayfish	reproduction	breeding feeding sheltering	3, 5, 6, 9
New Disturbance	aggregate sources	physical impacts to individuals	altered flow	A	I	dewatering strands crayfish	harass - harm	Nashville crayfish	reproduction	breeding	3, ***18***
New Disturbance	aggregate sources	physical impacts to individuals	chemical contaminants	A	D/I	chemicals in water affect crayfish	harm - harass	Nashville crayfish	reproduction	breeding feeding sheltering	3, 12, 14, 15**,** 16
O & M	aggregate sources	habitat degradation	increase in water temperature	A	I	increase in water temp stresses crayfish, reduces disease resistance and increases feed conversion ratios	harass	Nashville crayfish	reproduction	breeding feeding sheltering	9
New Disturbance	aggregate sources	habitat degradation	increase in water temperature	A	I	vegetation no longer shades stream - stresses poor crayfish - low dissolved oxygen	harass	Nashville crayfish streams & riparian area	n/a	feeding sheltering	3
O & M	aggregate sources	habitat degradation	increase in water temperature	A	I	increase in water temp stresses crayfish, reduces disease resistance and increases feed conversion ratios	harm - harass	Nashville crayfish	reproduction	breeding feeding sheltering	3
O & M	aggregate sources	habitat degradation	introduction of invasive species	A	I	crayfish are photosensitive and not amenable to be in cleared areas - allows competitors to invade	harm - harass	Nashville crayfish	reproduction	breeding feeding sheltering	3
New Disturbance	aggregate sources	interspecies competition	introduction of invasive species	A	I	displacement / interspecies competition drives them out	harm - harass	Nashville crayfish	reproduction	breeding feeding sheltering	3, 14
New Disturbance	aggregate sources	habitat degradation	sedimentation	A	D/I	tributary and/or near stream earth disturbance - sedimentation in water column and on stream bed	harass - mortality	Nashville crayfish streams & riparian area	numbers reproduction	breeding feeding sheltering	3
O & M	aggregate sources	habitat degradation	sedimentation	A	D/I	pipeline in stream becomes exposed over time, resulting in scour, sedimentation, etc.	harass - mortality	Nashville crayfish streams, Nashville crayfish	numbers reproduction	breeding feeding sheltering	3, 5, 9

Pipeline Activity	Subactivity	Threat	Stressor	Aggregate/ direct take	Direct/ Indirect	Stressor Pathway	Range of Response	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
New Disturbance	aggregate sources	interspecies competition	sedimentation	A	I	displacement / interspecies competition drives them out	harm - mortality	Nashville crayfish	numbers reproduction	breeding feeding sheltering	3, 4, 6
New Disturbance	aggregate sources	physical impacts to individuals	sedimentation	A	D	smothering of crayfish	harm - mortality	Nashville crayfish	numbers reproduction	breeding	3, 4
O & M	aggregate sources	physical impacts to individuals	sedimentation	A	D/I	pipeline in stream becomes exposed over time, resulting in scour, sedimentation, etc. - sedimentation smothers crayfish	harass - mortality	Nashville crayfish streams, Nashville crayfish	numbers reproduction distribution	breeding feeding sheltering	3, 6, 9
New Disturbance	aggregate sources	interspecies competition	substrate removal	A	I	disruption or removal of slab rock for stream crossing	harass - harm	Nashville crayfish streams	reproduction	breeding feeding sheltering	3, 8, ***10***
New Disturbance	aggregate sources	temporary loss of occupied habitat	substrate removal	A	D	disruption or removal of slab rock for stream crossing	harass - harm	Nashville crayfish slab rock	n/a	sheltering	3, 8, ***10***
O & M	aggregate sources	interspecies competition	tree removal	A	I	crayfish are photosensitive and not amenable to be in cleared areas - allows competitors to invade	harm - harass	Nashville crayfish	reproduction	breeding feeding sheltering	3, 5, 9
New Disturbance	access road construction - temporary	physical impacts to individuals	crushing	T	D	stream crossing	mortality	Nashville crayfish	numbers reproduction	breeding feeding sheltering	3, 8, ***10***
New Disturbance	access road construction - permanent	physical impacts to individuals	crushing	T	D	stream crossing	mortality	Nashville crayfish	numbers reproduction	breeding feeding sheltering	3, ***10***
New Disturbance	dry ditch (dam and pump installation/removal/operation)	physical impacts to individuals	crushing	T	D	equipment crushes individuals	harass - mortality	Nashville crayfish	numbers reproduction	breeding feeding sheltering	3, ***18***
O & M	instream stabilization - ROW-RRR	physical impacts to individuals	crushing	T	D	crayfish crushed	harm - mortality	Nashville crayfish	numbers reproduction	breeding feeding sheltering	3, 6
O & M	pipeline abandonment (removal)	physical impacts to individuals	crushing	T	D	equipment crushes individuals	mortality	Nashville crayfish	numbers reproduction	breeding feeding sheltering	3, 8, ***10, 11,*** 18
New Disturbance	access road construction - permanent	permanent loss of occupied habitat	substrate removal	T	D	disruption or removal of slab rock for stream crossing	harass - harm	Nashville crayfish slab rock	n/a	sheltering	3, ***10***

* standard font indicates mandatory AMM; **bold** and *italics* indicates non-mandatory AMM

Table 6.2.10.1-1 American Burying Beetle Threats Analysis Table

Pipeline Activity	Subactivity	Threat	Stressor	Aggregate/ direct take	Direct/ Indirect	Stressor Pathway	Range of Response	Resource Affected	Demographic Consequence	Conservation Need Affected	Management Options (AMMs)*
New Disturbance	tree clearing (> or equal to 5 dbh)	habitat loss	fragmentation	T	I	interspecies competition/loss of prey species	harass -mortality	American burying beetle	numbers reproduction	breeding feeding sheltering	*2,3,*4
New Disturbance	shrub clearing (woody< 5 dbh)	habitat loss	fragmentation	T	I	interspecies competition/loss of prey species	harass -mortality	American burying beetle	numbers reproduction	breeding feeding sheltering	*2,3,*4
New Disturbance	herbaceous clearing	habitat loss	fragmentation	T	I	interspecies competition/loss of prey species	harass -mortality	American burying beetle	numbers reproduction	breeding feeding sheltering	*2,3,*4
New Disturbance	clearing re-established vegetation (storage well const)	habitat loss	fragmentation	T	I	interspecies competition/loss of prey species	harass -mortality	American burying beetle	numbers reproduction	breeding feeding sheltering	*2,3,*4
O & M	off ROW land clearing (Gen App and Cathodic Protection Const)	habitat loss	vegetation clearing fragmentation	T	I	interspecies competition	harass – harm	American burying beetle	numbers reproduction	breeding feeding	*2,3,*4
New Disturbance	tree clearing (> or equal to 5 dbh)	habitat loss	tree clearing fragmentation	T	I	interspecies competition	harass – harm	American burying beetle	numbers reproduction	breeding feeding	*2,3,*4
New Disturbance	shrub clearing (woody< 5 dbh)	habitat loss	tree clearing fragmentation	T	I	interspecies competition	harass – harm	American burying beetle	numbers reproduction	breeding feeding	*2,3,*4
New Disturbance	herbaceous clearing	habitat loss	tree clearing fragmentation	T	I	interspecies competition	harass – harm	American burying beetle	numbers reproduction	breeding feeding	*2,3,*4
New Disturbance	clearing re-established vegetation (storage well const)	habitat loss	vegetation clearing fragmentation	T	I	interspecies competition	harass – harm	American burying beetle	numbers reproduction	breeding feeding	*2,3,*4
O & M	off ROW land clearing (Gen App and Cathodic Protection Const)	habitat loss	vegetation clearing fragmentation	T	I	reduced carrion/ prey	harass – harm	American burying beetle	numbers reproduction	breeding feeding	*2,3,*4
New Disturbance	tree clearing (> or equal to 5 dbh)	habitat loss	tree clearing	T	I	reduced carrion/ prey	harass – harm	American burying beetle	numbers reproduction	breeding feeding	*2,3,*4
New Disturbance	shrub clearing (woody< 5 dbh)	habitat loss	tree clearing	T	I	reduced carrion/ prey	harass – harm	American burying beetle	numbers reproduction	breeding feeding	*2,3,*4
New Disturbance	herbaceous clearing	habitat loss	tree clearing	T	I	reduced carrion/ prey	harass – harm	American burying beetle	numbers reproduction	breeding feeding	*2,3,*4

* standard font indicates mandatory AMM; **bold** and *italics* indicates non-mandatory AMM