APPENDIX E – ECOLOGICAL ENHANCEMENT AND MITIGATION MONITORING PROGRAM RESULTS

The proposed planting was completed in 2017 and ongoing monitoring indicates that the materials planted in 2015 and 2016 have acceptable survival rates. The monitoring and maintenance of materials planted in 2016 will wrap up in 2018 and material planted in 2017 will be monitored until 2019.

Walker Aggregates Inc.

DUNTROON QUARRY REFORESTATION PLANTING

Planting Quantities (Active Regeneration)

		2015 Planting		2016 Planting		2017 Planting		Project Total	
Deciduous Caliper Whips	**Size**	**Designed Qty**	**Planted Qty**	**Designed Qty**	**Planted Qty**	**Designed Qty**	**Planted Qty**	**Designed Qty**	**Planted Qty**
Acer rubrum	25mm	640	395	804	150	252	450	1,696	995
Acer saccharum	25mm	640	1,020	804	2,395	252	810	1,696	4,225
Betula papyrifera	25mm	640	500	804	100	252	190	1,696	790
Populus tremuloides	25mm	640	670	804	450	252	350	1,696	1,470
Prunus serotina	25mm	640	280	804	240	252	200	1,696	720
Quercus rubra	25mm	640	550	804	250	252	300	1,696	1,100
Tilia american	25mm	320	0	402	660	126	50	848	710
Total		**4,160**	**3,415**	**5,226**	**4,245**	**1,638**	**2,350**	**11,024**	**10,010**

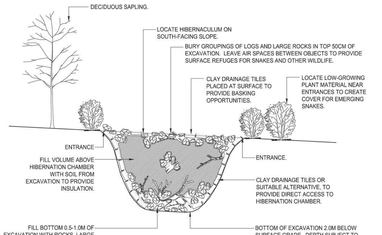
		2015 Planting		2016 Planting		2017 Planting		Project Total	
Deciduous Seedlings	**Size**	**Designed Qty**	**Planted Qty**	**Designed Qty**	**Planted Qty**	**Designed Qty**	**Planted Qty**	**Designed Qty**	**Planted Qty**
Acer rubrum	60-90cm	320	360	402	470	126	100	848	930
Acer saccharum	60-90cm	320	360	402	500	126	400	848	1,260
Betula allegheniensis	60-90cm	320	220	402	211	126	180	848	611
Betula papyrifera	60-90cm	320	360	402	470	126	375	848	1,205
Carya cordiformis	60-90cm	320	360	402	670	126	150	848	1,180
Fagus grandifolia	60-90cm	320	0	402	41	126	80	848	121
Juglans nigra	60-90cm	320	360	402	550	126	130	848	1,040
Ostrya virginiana	60-90cm								
Populus tremuloides	60-90cm	320	360	402	200	126	175	848	735
Prunus serotina	60-90cm	320	360	402	90	126	160	848	610
Quercus macrocarpa	60-90cm	320	360	402	700	126	150	848	1,210
Quercus rubra	60-90cm	320	360	402	500	126	172	848	1,032
Tilia americana	60-90cm	320	330	402	450	126	150	848	930
Ulmus americana	60-90cm	320	360	402	500	126	150	848	1,010
Total		**4,160**	**4,150**	**5,226**	**5,352**	**1,638**	**2,372**	**11,024**	**11,874**

		2015 Planting		2016 Planting		2017 Planting		Project Total	
Coniferous Seedlings	**Size**	**Designed Qty**	**Planted Qty**	**Designed Qty**	**Planted Qty**	**Designed Qty**	**Planted Qty**	**Designed Qty**	**Planted Qty**
Abies balsamea	24-40cm	640	950	804		252	940	1,696	1,890
Larix laricina	24-40cm	640	950	804	500	252	300	1,696	1,750
Picea glauca	24-40cm	640	800	804	1,700	252	425	1,696	2,925
Pinus strobus	24-40cm	801	1,000	1,004	1,700	315	400	2,120	3,100
Pinus resinosa	24-40cm	801	1,000	1,004		315	100	2,120	1,100
Thuja occidentalis	24-40cm	640	780	804	600	252	375	1,696	1,755
Tsuga canadensis	24-40cm	801	1,000	1,004		315	500	2,120	1,500
Total		**4,963**	**6,480**	**6,228**	**4,500**	**1,953**	**3,040**	**13,144**	**14,020**

SUMMARY									
		2015 Planting		2016 Planting		2017 Planting		Project Total	
TOTAL		**13,283**	**14,045**	**16,680**	**14,097**	**5,229**	**7,762**	**35,192**	**35,904**

NOTES:

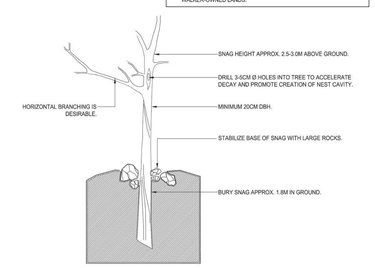
1. LOCATION OF HIBERNACULA (2) TO BE DETERMINED ON SITE.
2. LOGS, STUMPS, ROCKS, ETC. TO BE COLLECTED FROM WOODLOTS ON WALKER PROPERTY OR ADJACENT PROPERTIES WITH PERMISSION FROM THE LANDOWNER AND AT THE DIRECTION OF THE LANDSCAPE ARCHITECT. THE LANDSCAPE ARCHITECT RESERVES THE RIGHT TO REJECT ANY MATERIAL COLLECTED FROM OUTSIDE THE DESIGNATED AREAS. SEE DRAWING FOR LOCATION OF WALKER-OWNED LANDS.



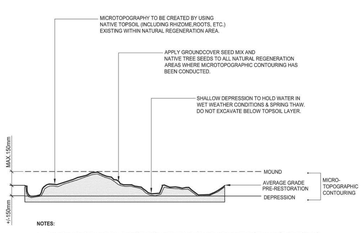
LD 1 — SNAKE HIBERNACULUM DETAIL N.T.S.

NOTES:

1. LOCATION OF SNAG TREES (10) TO BE DETERMINED ON SITE.
2. LOGS, STUMPS, ROCKS, ETC. TO BE COLLECTED FROM WOODLOTS ON WALKER PROPERTY OR ADJACENT PROPERTIES WITH PERMISSION FROM THE LANDOWNER AND AT THE DIRECTION OF THE LANDSCAPE ARCHITECT. THE LANDSCAPE ARCHITECT RESERVES THE RIGHT TO REJECT ANY MATERIAL COLLECTED FROM OUTSIDE THE DESIGNATED AREAS. SEE DRAWING FOR LOCATION OF WALKER-OWNED LANDS.



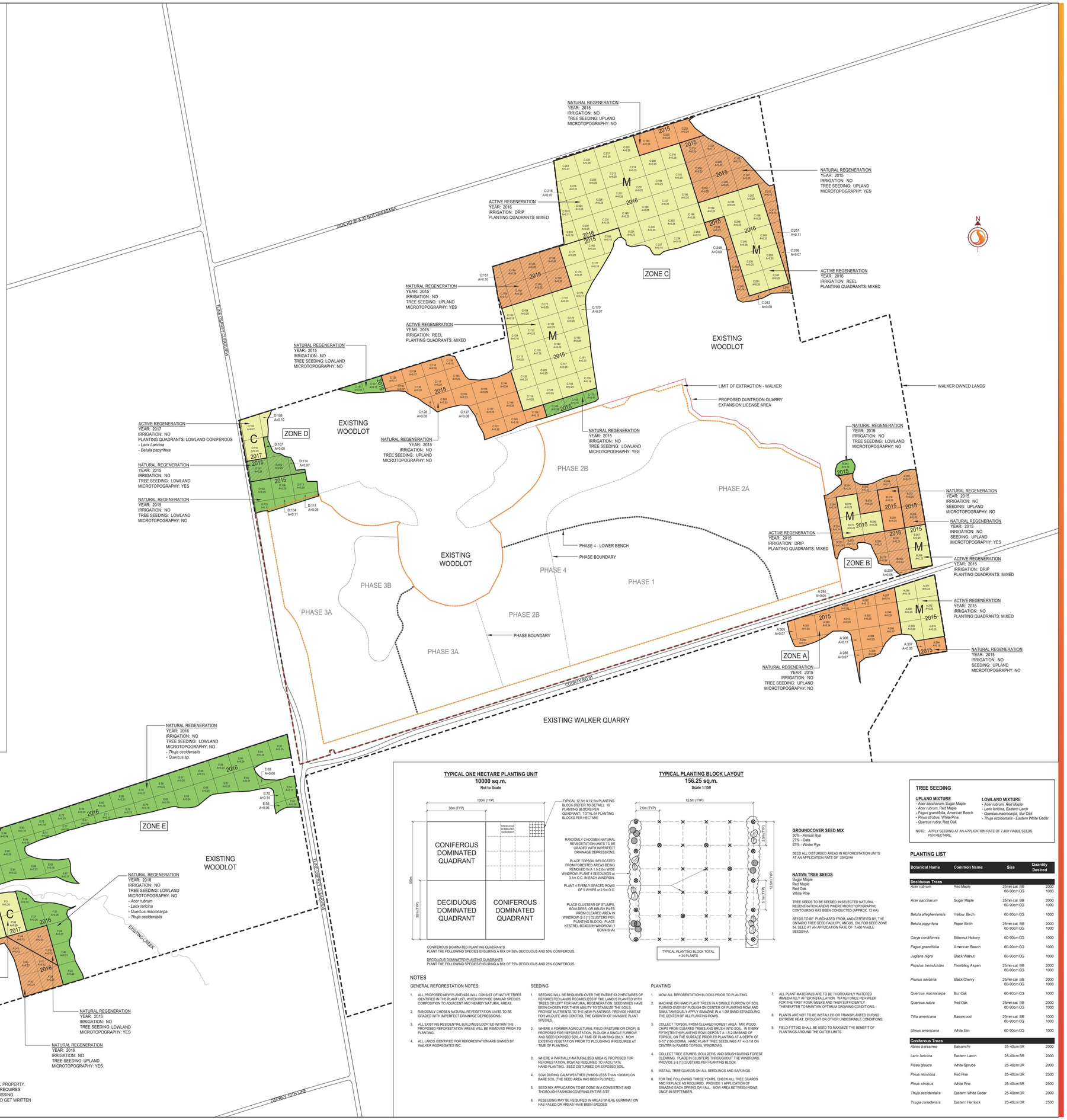
LD 2 — SNAG TREE DETAIL N.T.S.



NOTES:

1. RANDOMLY CHOSEN NATURAL REVEGETATION UNITES TO BE GRADED WITH IMPERFECT DRAINAGE DEPRESSIONS.
2. MICROTOPOGRAPHIC CONTOURING TO MATCH EXISTING GRADES AT LIMITS OF NATURAL REGENERATION BLOCK.

LD 3 — MICROTOPOGRAPHIC CONTOURING DETAIL N.T.S.



TYPICAL ONE HECTARE PLANTING UNIT
10000 sq.m.
Not to Scale

TYPICAL 12.5m X 12.5m PLANTING BLOCK (REFER TO DETAIL). 16 PLANTING BLOCKS PER QUADRANT. TOTAL 64 PLANTING BLOCKS PER HECTARE.

RANDOMLY CHOOSEN NATURAL REVEGETATION UNITS TO BE GRADED WITH IMPERFECT DRAINAGE DEPRESSIONS.

PLACE TOPSOIL RELOCATED FROM FORESTED AREAS BEING REMOVED IN A 1.5-2.0m WIDE WINDROW. PLANT 4 SEEDLINGS at 3.1m O.C. IN EACH WINDROW.

PLANT 4 EVENLY-SPACED ROWS OF 5 WHIPS at 2.5m O.C.

PLACE CLUSTERS OF STUMPS, BOULDERS, OR BRUSH PILES FROM CLEARED AREA IN WINDROW (2-3 [1] CLUSTERS PER PLANTING BLOCK). PLACE KESTREL BOXES IN WINDROW (1 BOX/4-5HA)

CONIFEROUS DOMINATED PLANTING QUADRANTS
PLANT THE FOLLOWING SPECIES ENSURING A MIX OF 50% DECIDUOUS AND 50% CONIFEROUS.

DECIDUOUS DOMINATED PLANTING QUADRANTS
PLANT THE FOLLOWING SPECIES ENSURING A MIX OF 75% DECIDUOUS AND 25% CONIFEROUS.

TYPICAL PLANTING BLOCK LAYOUT
156.25 sq.m.
Scale 1:150

TYPICAL PLANTING BLOCK TOTAL = 24 PLANTS

GROUNDCOVER SEED MIX
50% - Annual Rye
27% - Oats
23% - Winter Rye

SEED ALL DISTURBED AREAS IN REFORESTATION UNITS AT AN APPLICATION RATE OF 35KG/HA

NATIVE TREE SEEDS
Sugar Maple
Red Maple
Red Oak
White Pine

TREE SEEDS TO BE SEEDED IN SELECTED NATURAL REGENERATION AREAS WHERE MICROTOPOGRAPHIC CONTOURING HAS BEEN CONDUCTED (APPROX. 12 HA).

SEEDS TO BE PURCHASED FROM, AND CERTIFIED BY, THE ONTARIO TREE SEED FACILITY, ANGUS, ON, FOR SEED ZONE 34. SEED AT AN APPLICATION RATE OF 7,400 VIABLE SEEDS/HA.

TREE SEEDING

UPLAND MIXTURE
- *Acer saccharum*, Sugar Maple
- *Acer rubrum*, Red Maple
- *Fagus grandifolia*, American Beech
- *Pinus strobus*, White Pine
- *Quercus rubra*, Red Oak

LOWLAND MIXTURE
- *Acer rubrum*, *Red Maple*
- *Larix laricina*, *Eastern Larch*
- *Quercus macrocarpa*, *Bur Oak*
- *Thuja occidentalis - Eastern White Cedar*

NOTE: APPLY SEEDING AT AN APPLICATION RATE OF 7,400 VIABLE SEEDS PER HECTARE.

PLANTING LIST

Botanical Name	Common Name	Size	Quantity Desired
Deciduous Trees			
Acer rubrum	Red Maple	25mm cal. BB	2000
		60-90cm CG	1000
Acer saccharum	Sugar Maple	25mm cal. BB	2000
		60-90cm CG	1000
Betula alleghaniensis	Yellow Birch	60-90cm CG	1000
Betula papyrifera	Paper Birch	25mm cal. BB	2000
		60-90cm CG	1000
Carya cordiformis	Bitternut Hickory	60-90cm CG	1000
Fagus grandifolia	American Beech	60-90cm CG	1000
Juglans nigra	Black Walnut	60-90cm CG	1000
Populus tremuloides	Trembling Aspen	25mm cal. BB	2000
		60-90cm CG	1000
Prunus serotina	Black Cherry	25mm cal. BB	2000
		60-90cm CG	1000
Quercus macrocarpa	Bur Oak	60-90cm CG	1000
Quercus rubra	Red Oak	25mm cal. BB	2000
		60-90cm CG	1000
Tilia americana	Basswood	25mm cal. BB	1000
		60-90cm CG	1000
Ulmus americana	White Elm	60-90cm CG	1000
Coniferous Trees			
Abies balsamea	Balsam Fir	25-40cm BR	2000
Larix laricina	Eastern Larch	25-40cm BR	2000
Picea glauca	White Spruce	25-40cm BR	2000
Pinus resinosa	Red Pine	25-40cm BR	2500
Pinus strobus	White Pine	25-40cm BR	2500
Thuja occidentalis	Eastern White Cedar	25-40cm BR	2000
Tsuga canadensis	Eastern Hemlock	25-40cm BR	2500

SEEDING

1. SEEDING WILL BE REQUIRED OVER THE ENTIRE 53.2 HECTARES OF REFORESTED LANDS REGARDLESS IF THE LAND IS PLANTED WITH TREES OR LEFT FOR NATURAL REGENERATION. SEED MIXES HAVE BEEN CHOSEN FOR THEIR ABILITY TO STABILIZE THE SOILS, PROVIDE NUTRIENTS TO THE NEW PLANTINGS, PROVIDE HABITAT FOR WILDLIFE AND CONTROL THE GROWTH OF INVASIVE PLANT SPECIES.
2. WHERE A FORMER AGRICULTURAL FIELD (PASTURE OR CROP) IS PROPOSED FOR REFORESTATION, PLOUGH A SINGLE FURROW AND SEED EXPOSED SOIL AT TIME OF PLANTING ONLY. MOW EXISTING VEGETATION PRIOR TO PLOUGHING IF REQUIRED AT TIME OF PLANTING.
3. WHERE A PARTIALLY-NATURALIZED AREA IS PROPOSED FOR REFORESTATION, MOW AS REQUIRED TO FACILITATE HAND-PLANTING. SEED DISTURBED OR EXPOSED SOIL.
4. SOW DURING CALM WEATHER (WINDS LESS THAN 10KM/H) ON BARE SOIL (THE SEED AREA HAS BEEN PLOWED).
5. SEED MIX APPLICATION TO BE DONE IN A CONSISTENT AND THOROUGH FASHION COVERING ENTIRE SITE.
6. RESEEDING MAY BE REQUIRED IN AREAS WHERE GERMINATION HAS FAILED OR AREAS HAVE BEEN ERODED.

PLANTING

1. MOW ALL REFORESTATION BLOCKS PRIOR TO PLANTING.
2. MACHINE OR HAND PLANT TREES IN A SINGLE FURROW OF SOIL TURNED OVER BY PLOUGH ON CENTER OF PLANTING ROW AND SIMULTANEOUSLY APPLY SIMAZINE IN A 1.0M BAND STRADDLING THE CENTER OF ALL PLANTING ROWS.
3. COLLECT TOPSOIL FROM CLEARED FOREST AREA. MIX WOOD CHIPS FROM CLEARED TREES AND BRUSH INTO SOIL. IN EVERY FIFTH [TENTH] PLANTING ROW, DEPOSIT A 1.5-2.0M BAND OF TOPSOIL ON THE SURFACE PRIOR TO PLANTING AT A DEPTH OF 6-10" (150-200MM). HAND PLANT TREE SEEDLINGS AT +/-3.1M ON CENTER IN RAISED TOPSOIL WINDROWS.
4. COLLECT TREE STUMPS, BOULDERS, AND BRUSH DURING FOREST CLEARING. PLACE IN CLUSTERS THROUGHOUT THE WINDROWS, PROVIDE 2-3 [1] CLUSTERS PER PLANTING BLOCK.
5. INSTALL TREE GUARDS ON ALL SEEDLINGS AND SAPLINGS.
6. FOR THE FOLLOWING THREE YEARS, CHECK ALL TREE GUARDS AND REPLACE AS REQUIRED. PROVIDE 1 APPLICATION OF SIMAZINE EACH SPRING OR FALL. MOW AREA BETWEEN ROWS ONCE IN SEPTEMBER.
7. ALL PLANT MATERIALS ARE TO BE THOROUGHLY WATERED IMMEDIATELY AFTER INSTALLATION. WATER ONCE PER WEEK FOR THE FIRST FOUR WEEKS AND THEN SUFFICIENTLY THEREAFTER TO MAINTAIN OPTIMUM GROWING CONDITIONS.
8. PLANTS ARE NOT TO BE INSTALLED OR TRANSPLANTED DURING EXTREME HEAT, DROUGHT OR OTHER UNDESIRABLE CONDITIONS.
9. FIELD-FITTING SHALL BE USED TO MAXIMIZE THE BENEFIT OF PLANTINGS AROUND THE OUTER LIMITS.

NOTES

GENERAL REFORESTATION NOTES:

1. ALL PROPOSED NEW PLANTINGS WILL CONSIST OF NATIVE TREES IDENTIFIED IN THE PLANT LIST, WHICH PROVIDE SIMILAR SPECIES COMPOSITION TO ADJACENT AND NEARBY NATURAL AREAS.
2. RANDOMLY CHOSEN NATURAL REVEGETATION UNITS TO BE GRADED WITH IMPERFECT DRAINAGE DEPRESSIONS.
3. ALL EXISTING RESIDENTIAL BUILDINGS LOCATED WITHIN THE PROPOSED REFORESTATION AREAS WILL BE REMOVED PRIOR TO PLANTING.
4. ALL LANDS IDENTIFIED FOR REFORESTATION ARE OWNED BY WALKER AGGREGATES INC.

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Notes



Legend

- PROPOSED DUNTROON QUARRY EXPANSION LICENSE AREA
- LIMIT OF EXTRACTION - WALKER
- PHASE BOUNDARY
- PHASE 4 - LOWER BENCH
- ROAD
- WALKER OWNED LANDS
- TYPICAL PLANTING BLOCK
- ZONE
- REFORESTATION UNIT
- AREA (HECTARES)
- 2015 YEAR OF PLANTING TREATMENT

PLANTING TREATMENT
- ACTIVE REGENERATION
- NATURAL REGENERATION - TREE SEEDING LOWLAND MIX
- NATURAL REGENERATION - TREE SEEDING UPLAND MIX

TYPICAL ONE HECTARE PLANTING UNIT
- D DECIDUOUS DOMINATED PLANTING
- C CONIFEROUS DOMINATED PLANTING
- M MIXED DECIDUOUS AND CONIFEROUS DOMINANTED PLANTING

SEEDING
- MICROTOPOGRAPHIC CONTOURING

1.	ISSUED FOR CONSTRUCTION	BM	DL	15.09.23
	Revision	By	Appd.	YY.MM.DD
File Name:	42602732_L-1.dwg	BM	DL	15.09.18
		Dwn.	Chkd.	Dsgn. YY.MM.DD

Permit-Seal

Client/Project
WALKER AGGREGATES INC.
DUNTROON QUARRY EXPANSION
ADAPTIVE MANAGEMENT PLAN
Duntroon ON Canada

Title
REFORESTATION PLANTING PLAN

Project No.	Scale	Revision
42602732	1:3000 (0 30 90 150m)	1
Drawing No.	Sheet	
L-1	1 of 1	

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2015/10/23 7:48 PM By: Dough, Derek
ORIGINAL SHEET - ARCH E