FCPZ
FLATHEAD COUNTY PLANNING AND ZONING

Gravel Resources Map

Updated: April 14, 2010

Legend

- Rivers, Lakes & Streams
- City Planning Jurisdictions/Interlocal Agreement Areas
- Platted Subdivisions
- ▲ Gravel Pits: Existing MDEQ Open-Cut Permits

Gravel Pits: Flathead County Inventory (thru 2006)

- ACTIVE
- INACTIVE
- RECLAIMED
- UNKNOWN

Surficial Soils: MT Bureau of Mines and Geology

- QTs - Quaternary or Tertiary Sediment
- Qaf - Alluvial Fan Deposit
- Qal - Alluvium of Modern Channels and Floodplains
- Qao - Alluvium, Older
- Qe - Eolian Deposit
- Qge - Glacial Esker Deposit
- Qgi - Glacial Ice Contact Deposit
- Qgl - Glacial Lake Deposit
- Qgls - Glacial Lake Deposit, Sandy
- Qgo - Glacial Outwash Deposit
- Qgoo - Glacial Outwash Deposit, Older
- Qgt - Glacial Till
- Qgta - Glacial Till, Ablation Deposit
- Qlk - Lake Deposit
- Qls - Landslide Deposit
- Qoa - Unidentified
- Tk - Kishenehn Formation
- Ybe - Belt Supergroup Rocks, Undivided

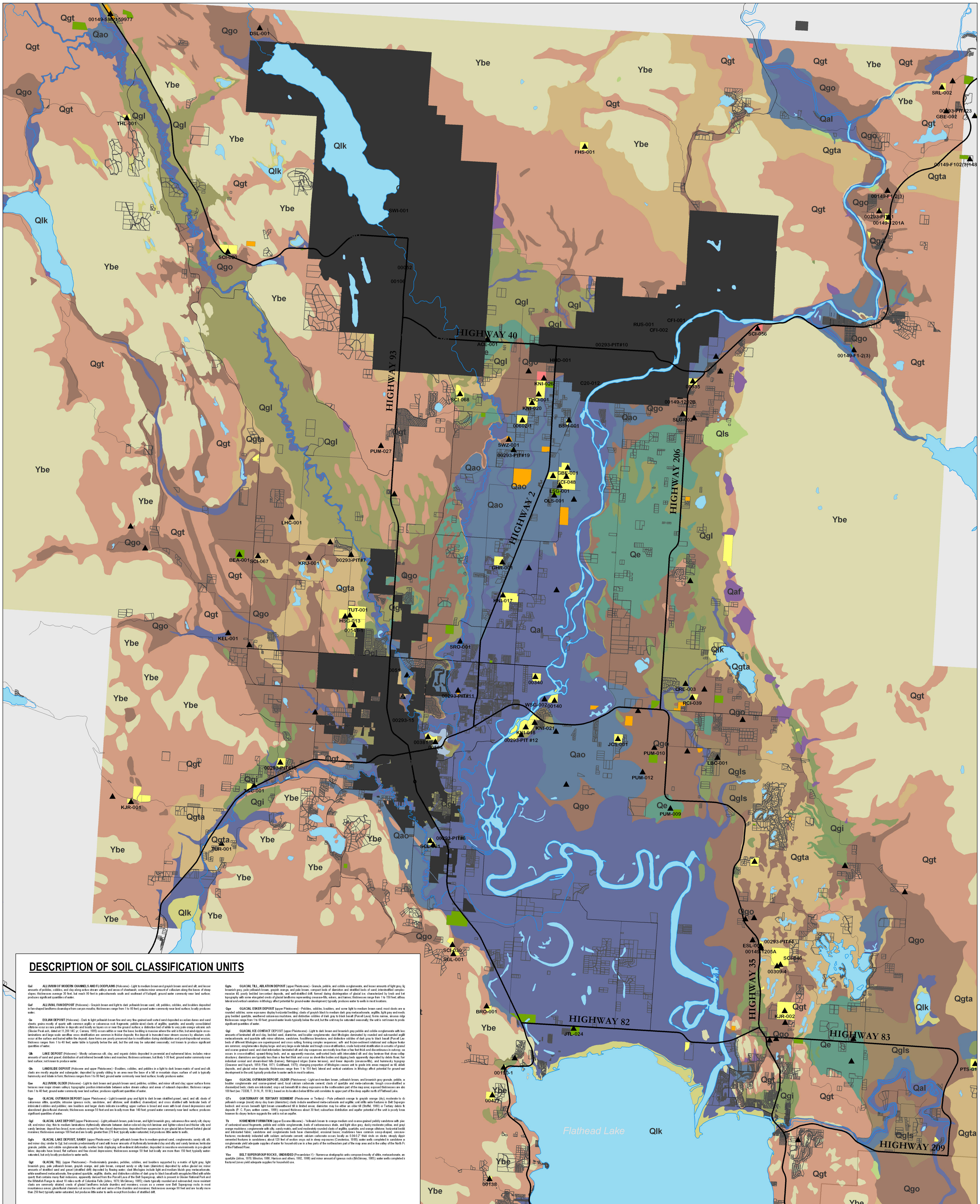

TABLE - MDEQ OPEN CUT PERMITS

PERMIT_N_1	OPERATOR	SITE_NAME	PIT_STATUS
	JOHNSTON, JERRY	MARION	ACTIVE
	KNIFE RIVER	WILCOX	ACTIVE
	WILKE, LAURENCE	WILKE SAND	ACTIVE
	SCHELLINGER CONSTRUCTION	TUTVEDT2	ACTIVE
	LASALLE SAND AND GRAVEL	LASALLE	ACTIVE
	KLEMPEL, JOE AND RON	KLEMPEL	ACTIVE
	WAGONERS SAND AND GRAVEL	HOLCOMB	ACTIVE
	PLUM CREEK NORTHWEST LUMBER INC.	COLUMBIA HEIGHTS	ACTIVE
	BRASH PROJECTS	BRUNNER	INACTIVE
	HAMILTON, HOWARD	BLUEMOON	ACTIVE
	BLAINE COUNTY ROAD DEPARTMENT	CROWLEY YOUNG RANCH	INACTIVE
	WHITE ROCK AGGREGATE	HOMANN	ACTIVE
	MCELROY AND WILKEN	PACK	ACTIVE
	RIVERSIDE CONTRACTING	MCHENRY	ACTIVE
	TUTVEDT, BRUCE & LINDA	TUTVEDT	ACTIVE
	T-BEND CONSTRUCTION	THORNBERRY	ACTIVE
	WHITE ROCK AGGREGATE	SANDON	ACTIVE
	JTL GROUP INC DBA MCELROY AND WILKEN	RIVER PIT PRELAW	ACTIVE
	SCHELLINGER CONSTRUCTION CO., INC	BLASDEL	ACTIVE
	SCHELLINGER CONSTRUCTION CO., INC	AVERILL	ACTIVE
	KNIFE RIVER	NORTH VALLEY	ACTIVE
TUR-001	TURNER, WAYNE	TURNER	ACTIVE
	DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION	ASHLEYCREEK	ACTIVE
HAN-001	NEIL HANSON	AREA19	ACTIVE
BRO-001	PAMELA BROWN	OLD SOMMERS	ACTIVE
SGL-001	SPOKLIE GRANT	SPOKLIE	ACTIVE
	SCHELLINGER CONSTRUCTION COMPANY	LINDSEY LANE	ACTIVE
	KNUDSEN, DOUG	KNUDSEN2	ACTIVE
SCI-046	SCHELLINGER CONSTRUCTION COMPANY	SULLIVAN	ACTIVE
00138	ANDERSON, LLOYD	ANDERSON	ACTIVE
SCI-030	SCHELLINGER CONSTRUCTION COMPANY	HETLAND2	ACTIVE
SCL-001	SCHLEGEL AND SONS CONTRACTOR INC	WISE	ACTIVE
00293-PIT#6	FLATHEAD COUNTY ROAD DEPARTMENT	GUDGEL	ACTIVE
MLE-002	MANY LAKES EAST	BRIST	ACTIVE
	ESLICK, PAUL	ESLICK	ACTIVE
JTL-024	JTL GROUP INC	KLEINHANS	ACTIVE
00293-PIT#4	FLATHEAD COUNTY ROAD DEPARTMENT	FOX	ACTIVE
00190-1	NEIL DOTEN	DOTEN	ACTIVE
PTS-01	POTTS, LYLE	POTTS	ACTIVE
GLL-002	GRIZZLY LOGGING AND LUMBER LLC DBA GRIZZLY	WELCOMESPRINGS	ACTIVE
KJR-002	KLEMPEL, JOE AND RON	KLEMPEL2	ACTIVE
00477	NORVELL-EVART, LINDA	SIDERIUS	ACTIVE
	HILL, LARRY	HILL	ACTIVE
	UNKNOWN	TOPSOIL1	ACTIVE
00309-4	MISSION VALLEY CONCRETE	SULLIVAN	ACTIVE
WDR-001	WOODRING, ERIC	MARION	ACTIVE
00293-PIT#19	FLATHEAD COUNTY ROAD DEPARTMENT	WISHERT	ACTIVE
00381	MCELROY AND WILKEN INC	WILCOX	ACTIVE
DSL-001	DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION	WHITEFISH LAKE	ACTIVE
00052	CITY OF WHITEFISH	WHITEFISH CITY	ACTIVE
	UNKNOWN	WESTFAL	ACTIVE
C20-012	FLATHEAD COUNTY ROAD DEPARTMENT	WALSH	ACTIVE
00140	WAGONERS SAND AND GRAVEL	RV PARK	ACTIVE
WSG-002	WAGONERS SAND AND GRAVEL	RIVER	ACTIVE
MUR-001	MURPHYS EXCAVATING INC	WAGAR	ACTIVE
	VALLEY WIDE	VALLEYWIDE	ACTIVE
	FLATHEAD COUNTY ROAD DEPARTMENT	WESTGLACIER	ACTIVE
	WILKE, LAWRENCE	WILKE	ACTIVE
	UNKNOWN	UNK6	ACTIVE
	STOLFUSS, JOHN AND LARRY	STOLLFUS	ACTIVE
	TIMIS, JIM	TIMIS	ACTIVE
SCI-067	SCHELLINGER CONSTRUCTION COMPANY	TUTVEDT2	ACTIVE
TUT-001	TUTVEDT, BRUCH AND LINDA	TUTVEDT1	ACTIVE
RUS-001	RUSSELL, KIMBERLY J	TUCKER	ACTIVE
SWZ-001	SCHWARZ CONSTRUCTION	TRUMBLE CREEK ROAD	ACTIVE
HSG-013	HELENA SAND AND GRAVEL INC	TRACHT	ACTIVE
00602-1	T BEND CONSTUCTION	THORNBERRY	ACTIVE
	UNKNOWN	SMITH	ACTIVE
DNR-010	DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION	SKUNKMEADOWS	ACTIVE
BEA-001	BEASLEY, JOE	SILVERSTONE	ACTIVE
HNK-002	NORMAK K HANSON	SICKLERSHALE2	ACTIVE
HNK-001	NORMAN K HANSON	SICKLERSHALE	ACTIVE
00293-PIT#16	FLATHEAD COUNTY ROAD DEPARTMENT	SHEEPHERDER	ACTIVE
00293-15	FLATHEAD COUNTY ROAD DEPARTMENT	SCHACKO	ACTIVE
	WHITE ROCK AGGREGATE LLC	SANDON	ACTIVE
ACE-001	AC ENTERPRISES	KLSANDBOX	ACTIVE
	UNKNOWN	ROLLAND ANDREWS	ACTIVE
00340	ROBINSON SAND AND GRAVEL	ROBINSON	ACTIVE
KNI-021	KNIFE RIVER	RIVERPIT1	ACTIVE
00462-24	SCHELLINGER CONSTRUCTION COMPANY	REGAS	ACTIVE
	UNKNOWN	REGAS	ACTIVE
KNI-018	KNIFE RIVER	OLD STEEL BRIDGE	ACTIVE
SCI-020	SCHELLINGER CONSTRUCTION COMPANY	PESCHEL2	ACTIVE
OLS-001	OLSEN, RUSSELL	PAVECO	ACTIVE
00554	MCELROY AND WILKEN INC	PACK	ACTIVE
	OLSEN, MARION	OLSEN	ACTIVE
00293-PIT #12	FLATHEAD COUNTY ROAD DEPARTMENT	OLD STEEL BRIDGE	ACTIVE
	UNKNOWN	OLDPIT	ACTIVE
	DETTWILER, ROY	DETTWILER	ACTIVE
	UNKNOWN	OLD6	ACTIVE
SWI-001	SWIFT CREEK CABINS LLC	MUIR	ACTIVE
KNI-026	MOTICHKA	MOTICHKA	ACTIVE
KNI-017	KNIFE RIVER	MOHL	ACTIVE
00293-PIT#10	FLATHEAD COUNTY ROAD DEPARTMENT	MILLS	ACTIVE
RCI-039	RIVERSIDE CONTRACTING INC	MCHENRY	ACTIVE
	PLUM CREEK TIMBERLANDS LP	MCGREGOR	ACTIVE
PUM-009	PUMCO	MAST	ACTIVE
00149-1212A	DEPARTMENT OF TRANSPORTATION	MARION	ACTIVE
CRE-003	CRESTON TOPSOIL	LORENTZEN	ACTIVE
00541-1	LHC INC	LHC	ACTIVE
	LUM OWENS	LUMOWENS	ACTIVE
LSG-001	LASALLE SAND AND GRAVEL	LASALLE	ACTIVE
KJR-001	KLEMPEL, JOE AND RON	KLEMPEL	ACTIVE
KEL-001	KELLER, LES	KELLER	ACTIVE
	DR. KAUFMAN	KAUFMAN	ACTIVE
SCI-048	SCHELLINGER CONSTRUCTION COMPANY	JELLISON	ACTIVE
GBE-002	GOOSE BAY EQUIPMENT INC	JANDRON	ACTIVE
THI-001	TUNGSTEN HOLDINGS INC	ISLANDLAKE	ACTIVE
00293-PIT#7	FLATHEAD COUNTY ROAD DEPARTMENT	INGRAHAM	ACTIVE
0051	PACK AND COMPANY/NUPAC	HUTTON	ACTIVE
	SWAN & SONS	HUTTON	ACTIVE
USF-001	US FISH AND WILDLIFE SERVICE	HORSE RANCH	ACTIVE
JCS-001	JIM CLARK AND SON CONTRACTING	HOLCOMB	ACTIVE
KNI-020	KNIFE RIVER	HODGSON	ACTIVE
SCI-033	SCHELLINGER CONSTRUCTION COMPANY	HILLTOP WEST	ACTIVE
00106	HAMILTON, HOWARD	HAMILTON1A	ACTIVE
	HAMILTON, JUDY	HAMILTON	ACTIVE
	PLUM CREEK NORTHWEST LUMBER INC	COLUMBIA HEIGHTS	ACTIVE
WAG-001	WAGAR, JOE	GOPHER	ACTIVE
GBE-001	GOOSE BAY EQUIPMENT	GOOSE	ACTIVE
STW-01	STW PARTNERSHIP	STW	ACTIVE
GHR-001	GLACIER HORSE RANCH	GLACIE RANCH	ACTIVE
STP-001	SILVERTIP PROPERTIES	EVERS CREEK	ACTIVE
SRL-002	SPOKLIE, ROBERT L	EVANS	ACTIVE
DNR-013	DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION	EASTMARTN	ACTIVE
THL-001	TAMARACK HOLDINGS, LLC	DONSBACH	ACTIVE
00335	DOANE, DON	DOANE	ACTIVE
THO-001	THORNBERRY, RON AND ESTER	DAIRY	ACTIVE
SCI-056	SCHELLINGER CONSTRUCTION COMPANY	SCHMIDT COLUMBIA HEIGHTS	ACTIVE
CFI-001	COLUMBIA FALLS INDUSTRIAL PARK	CFIP	ACTIVE
00293-1	FLATHEAD COUNTY ROAD DEPARTMENT	BUSCH	ACTIVE
BSH-001	BRASH PROJECTS LLC	BRUNNER	ACTIVE
00149-1201A	DEPARTMENT OF TRANSPORTATION	BRAS	ACTIVE
HHD-001	HAMILTON, HOWARD D	BLUEMOON	ACTIVE
00149-F1-2(3)	DEPARTMENT OF TRANSPORTATION	HUNGRYHORSE	ACTIVE
SLG-002	SPOKLIE, GRANT	COLUMBIA FALLS	ACTIVE
CFI-002	COLUMBIA FALLS INDUSTRIAL PARK	FOURTHSTREET	ACTIVE
FHS-001	FH STOLTZE LAND LAND LUMBER COMPANY	FOURMILE	ACTIVE
	ESLICK, PAUL	ESLICK	ACTIVE
KRU-001	KRUEGER, GARY	KRUEGER	ACTIVE
DSL-003	DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION	CHICKENCREEK	ACTIVE
CLA-001	CLARK, ED A	ED CLARK	ACTIVE
DSL-004	DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION	EWING	ACTIVE
	DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION	MOCK	ACTIVE
SRO-001	STREET, ROBIN	WHITEFISH RIVER	ACTIVE
	WAGONER SAND AND GRAVEL	MILLERSAND	ACTIVE
	CRAIG HICKENBOTHAM	HICKENBOTHAM	ACTIVE
	WOGONER	WAGONERSAND	ACTIVE
	RHODES, KARL	RHODES2	ACTIVE
	RHODES, KARL	RHODES1	ACTIVE
PUM-027	PUMCO INC	KEMPF	ACTIVE
	DEPARTMENT OF RESOURCES AND TRANSPORTATION	JOHNSON	ACTIVE
LHC-001	LHC INC	TUTVEDT3	ACTIVE
00293-PIT#11	FLATHEAD COUNTY ROAD DEPARTMENT	NELSON	ACTIVE
	GROSSWILER	GROSSWILER2	ACTIVE
00149-F1-2(3)	DEPARTMENT OF TRANSPORTATION	KRALL	ACTIVE
00149-F102(3)14	DEPARTMENT OF TRANSPORTATION	OHNSTAD AND BORMLEY	ACTIVE
00293-PIT#1	FLATHEAD COUNTY ROAD DEPARTMENT	CORAM	ACTIVE
	KRUEGER	FOXFARM	ACTIVE
LBC-001	LEIGHTY BROS CONSTRUCTION LLC	FOXHILLS	ACTIVE
	WHITE ROCK AGGREGATE LLC	HOMANN	ACTIVE
	TIMIS, JIM	TIMIS	ACTIVE
PCT-002	PLUM CREEK TIMBERLANDS LP	WEST MCGREGOR	ACTIVE
T&C-001	CHARLAND, STEVER	SMITHVALLEY	ACTIVE
DSL-005	DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION	ANCHORFLATS	ACTIVE
DSL-006	DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION	SHORTSMEADOW	ACTIVE
DNR-009	DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION	EAST SWIFT	ACTIVE
DNR-014	DEPARTMENT OF NATURAL RESOURCES AND CONSERVATOIN	156MILE	ACTIVE
	UNKNOWN	POLEBRIDGE	ACTIVE
00275	PLUM CREEK TIMBERLANDS LP	71MILE	ACTIVE
00275-5	PLUM CREEK TIMBERLANDS LP	PIT #9	ACTIVE
PUM-010	PUMCO	SNELL	ACTIVE
PUM-012	PUMCO	JAQUETTE	ACTIVE
00149-1212B	MARION HILLTOP	MARION HILLTOP	ACTIVE
00293-PIT#23	FLATHEAD COUNTY ROAD DEPARTMENT	KINNIKINICK	ACTIVE
00149-1202B	DEPARTMENT OF TRANSPORTATION	COLUMBIA HEIGHTS	ACTIVE
00149-1205A	DEPARTMENT OF TRANSPORTATION	FOX	ACTIVE
00149-F12(8)81	DEPARTMENT OF TRANSPORTATION	STATE	ACTIVE
00149-SMP15997	DEPARTMENT OF TRANSPORTATION	OLNEY	ACTIVE
00149-ERF072(2)	DEPARTMENT OF TRANSPORTATION	WEST GLACIER	ACTIVE
	DEPARTMENT OF RESOURCES AND CONSERVATION	PLEASANTVALLEY	ACTIVE
	TWIN PEASKS FARMS LLC	HENDRICK	ACTIVE
	KNUTSEN, DOUG	KNUTSEN	ACTIVE
	SAUERBIER, ROY	SAUERBIER	ACTIVE
	CLARK PHYLLIS	CLARK	ACTIVE
	SCHELLINGER CONSTRUCTION COMPANY	BLASDEL	ACTIVE
	SCHELLINGER CONSTRUCTION COMPANY	AVERILL	ACTIVE
ESL-001	ESLICK, PAUL	CORNELIUSON	ACTIVE
	UNKNOWN	OLD PIT	ACTIVE
	VRANISH	VRANISH	ACTIVE
	GOODE	GOODE	ACTIVE
	UNKNOWN	COONHOLLOW	ACTIVE
	GUERRERO, TERRY	GUERRERO	ACTIVE
	BEEMAN, TRACY	DNRC	INACTIVE
	WOODRING, EARL	WOODRING	ACTIVE
	KNIFE RIVER	NORTH VALLEY	ACTIVE
	CITY OF KALLISPELL	BUFFALOHEAD	ACTIVE
	KRAUSE	KRAUSE	ACTIVE
SCI-068	SCHELLINGER CONSTRUCTION COMPANY	CARLSON	ACTIVE
	DEPARTMENT OF NATURAL RESOURCES	ASHLEYCREEK	ACTIVE
	SCHELLINGER CONSTRUCTION	SULLIVAN	ACTIVE
	MISSION VALLEY CONCRETE	SULLIVAN	ACTIVE

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DESCRIPTION OF SOIL CLASSIFICATION UNITS

Qal **ALLUVIUM OF MODERN CHANNELS AND FLOODPLAINS** (Holocene) - Light to medium brown and grayish brown sand and silt, and lesser amounts of pebbles, cobbles, and clay along active stream valleys and areas of sheetwash; contains minor amount of colluvium along the bases of steep slopes; thicknesses average 30 feet, but reach 90 feet in paleochannels south and southeast of Kalispell; ground water commonly near land surface; produces significant quantities of water.

Qaf **ALLUVIAL FAN DEPOSIT** (Holocene) - Grayish brown and light to dark yellowish brown sand, silt, pebbles, cobbles, and boulders deposited in fan-shaped landforms downslope from canyon mouths; thicknesses range from 1 to 60 feet; ground water commonly near land surface; locally produces water.

Qe **EOLIAN DEPOSIT** (Holocene) - Dark to light yellowish brown fine and very fine-grained well sorted sand deposited as eolian dunes and sand sheets; grains mostly of quartz with common argillic or calcareous rock fragments; pebble-sized clasts of argillite, quartzite, and weakly consolidated siltstone occur as rare particles in deposits and locally as layers on or near the ground surface; a distinctive bed of white to very pale orange volcanic ash (Glacier Peak ash, dated at 11,200 14C yr; Carrara, 1995) occurs within or near the base; bedding is massive where the unit is thin, but wind-ripple cross-laminations and large-scale sandflow cross stratification are common in thicker deposits; the deposit is truncated near stream courses by alluvium; soils occur at the surface and buried within the deposit; dune forms are poorly preserved due to modification during stabilization and post-depositional erosion; thickness ranges from 1 to 40 feet; water table is typically below the unit, but the unit may be saturated seasonally; not known to produce significant quantities of water.

Qlk **LAKE DEPOSIT** (Holocene) - Mostly calcareous silt, clay, and organic debris deposited in perennial and ephemeral lakes; includes minor amounts of sand and gravel; distribution of unit inferred beneath lakes and marshes; thickness unknown, but likely 1-30 feet; ground water commonly near land surface; not known to produce water.

Qls **LANDSLIDE DEPOSIT** (Holocene and upper Pleistocene) - Boulders, cobbles, and pebbles in a light to dark brown matrix of sand and silt; clasts are mostly angular and subangular; deposited by gravity sliding to an area near the base of a hill or mountain slope; surface of unit is typically hummocky and lobate in form; thickness ranges from 1 to 80 feet; ground water commonly near land surface; locally produces water.

Qao **ALLUVIUM, OLDER** (Holocene) - Light to dark brown and grayish brown sand, pebbles, cobbles, and minor silt and clay; upper surface forms terraces near major stream valleys; topographic position intermediate between active stream valleys and areas of outwash deposition; thickness ranges from 1 to 40 feet; ground water commonly near land surface; produces significant quantities of water.

Qgo **GLACIAL OUTWASH DEPOSIT** (upper Pleistocene) - Light brownish gray and light to dark brown stratified gravel, sand, and silt; clasts of calcareous siltite, quartzite, intrusive igneous rocks, sandstone, and siltstone; well stratified, channelized, and cross stratified with lenticular beds of imbricated cobbles and pebbles; rare boulders and larger clasts indicate ice-rafting; upper surface is broad and even with local closed depressions and abandoned glacio-fluvial channels; thicknesses average 50 feet and are locally more than 140 feet; ground water commonly near land surface; produces significant quantities of water.

Qgl **GLACIAL LAKE DEPOSIT** (upper Pleistocene) - Light yellowish brown, pale brown, and light brownish gray, calcareous fine sandy silt, clayey silt, and minor clay; thin to medium laminations rhythmically alternate between darker-colored clay-rich laminae and lighter-colored and thicker silty and sandy laminae; deposit has broad, even surfaces except for few closed depressions; deposited from suspension in pro-glacial lakes formed behind glacial moraines; thicknesses average 100 feet and are locally greater than 270 feet; typically water-saturated, but produces little water to wells.

Qgls **GLACIAL LAKE DEPOSIT, SANDY** (upper Pleistocene) - Light yellowish brown fine to medium-grained sand, conglomerate, sandy silt, silt, and minor clay; similar to Qgl, but consists predominantly of sand with lesser amounts of rhythmically laminated clay and silty and sandy laminae; lenticular granule, pebble, and cobble conglomerate locally overlies beds displaying soft-sediment deformation; deposited in nearshore environments in pro-glacial lakes; deposits have broad, flat surfaces and few closed depressions; thicknesses average 50 feet but locally are more than 150 feet; typically water-saturated, but only locally productive to water wells.

Qgt **GLACIAL TILL** (upper Pleistocene) - Predominately granules, pebbles, cobbles, and boulders supported by a matrix of light gray, light brownish gray, pale yellowish brown, grayish orange, and pale brown, compact sandy or silty loam (diamicton) deposited by active glacial ice; minor amounts of stratified sand and gravel (stratified drift) deposited by flowing water; clast lithologies include light and medium bluish gray metacarbonate, white weathered metacarbonate, fine-grained quartzite, argillite, diorite, and distinctive cobbles of dark gray to black basalt with amygdules filled with white quartz that contains many fluid inclusions, apparently derived from the Purcell Lava of the Belt Supergroup, which is present in Glacier National Park and the Whitefish Range to about 10 miles north of Columbia Falls (Johns, 1970; McGimsey, 1985); clasts typically rounded and subrounded; more resistant clasts are commonly striated; crests of glacial landforms include drumlins and moraines; occurs as a veneer over Belt Supergroup rocks in most mountainous areas; glaciofluvial channels cut across the unit and some of the drumlins and moraines; thicknesses average 90 feet and are locally more than 250 feet; typically water-saturated, but produces little water to wells except from bodies of stratified drift.

Qgta **GLACIAL TILL, ABLATION DEPOSIT** (upper Pleistocene) - Granule, pebble, and cobble conglomerate, and lesser amounts of light gray, lig brownish gray, pale yellowish brown, grayish orange, and pale brown, compact beds of diamicton and stratified beds of sand; interstratified complex massive till, poorly bedded ice-contact deposits, and well-stratified drift; formed during disintegration of glacial ice; characterized by knob and ket topography with some elongated crests of glacial landforms representing crevasse-fills, eskers, and kames; thicknesses range from 1 to 150 feet; althou lateral and vertical variations in lithology affect potential for ground-water development, typically produces water to wells in most locations.

Qge **GLACIAL ESKER DEPOSIT** (upper Pleistocene) - Pebbles, cobbles, boulders, and some light to medium brown sand; most clasts are w rounded cobbles; some exposures display horizontal bedding; clasts of grayish black to medium dark gray metacarbonate, argillite, light gray and mediu gray bedded quartzite, weathered calcareous mudstone, and distinctive cobbles of dark gray to black basalt (Purcell Lava); forms narrow, sinuous ridge thicknesses range from 1 to 60 feet; ground-water levels typically below the unit, but the unit may be saturated seasonally; the unit is not known to produ significant quantities of water.

Qgi **GLACIAL ICE-CONTACT** DEPOSIT (upper Pleistocene) - Light to dark brown and brownish gray pebble and cobble conglomerate with less amounts of laminated silt and clay, bedded sand, diamicton, and boulder conglomerate; clast lithologies dominated by rounded and subrounded argillit metacarbonate, and quartzite with minor siltstone, sandstone, fossiliferous limestone, and distinctive cobbles of dark gray to black basalt (Purcell Lava beds of different lithologies are superimposed and cross cutting, forming complex sequences; soft- and frozen-sediment rotational and collapse featur are common; conglomerates display large- and very large-scale tabular and trough cross-stratification, crude horizontal stratification in a matrix of granul and coarse-grained sand, and clast imbrication; laminated silt and clay sequences are mostly less than a few feet thick and discontinuous in outcrop; sa occurs in cross-stratified, upward-fining beds, and as apparently massive, well-sorted beds with intercalated silt and clay laminae that show collap structures; diamictons are typically less than a few feet thick and occur as sheet-like bodies and dipping beds apparently deposited by debris flows; forr individual conical and stream-lined hills (kames), flat-topped ridges (kame terraces), and linear deposits (crevasse-fills), and hummocky topograp (Gravenor and Kupsch, 1959; Flint, 1971; Goldthwait, 1975); changing proportion of lithologies causes unit to grade into areas mapped as till, ablati deposits, and glacial esker deposits; thicknesses range from 1 to 150 feet; lateral and vertical variations in lithology affect potential for ground-wat development in the unit; typically productive to water wells in most locations.

Qgoo **GLACIAL OUTWASH DEPOSIT, OLDER** (Pleistocene) - Light and medium brown, yellowish brown, and brownish gray granule, pebble, a boulder conglomerate and coarse-grained sand; local calcium carbonate cement; clasts of quartzite and meta-carbonate; trough cross-stratified a channelized beds; clasts are imbricated; crops out beneath till in steep exposures in the northeastern part of the map area; exposed thicknesses are abo 100 feet (sec 7 DDB, T. 31 N., R. 19 W.); based on its location below till the unit correlates to upper part of the deep aquifer north of Flathead Lake.

QTs **QUATERNARY OR TERTIARY SEDIMENT** (Pleistocene or Tertiary) - Pale yellowish orange to grayish orange (dry), moderate to da yellowish orange (moist) stony clay loam (diamicton); clasts include weathered meta-carbonate and argillite; unit infills wide fractures in Belt Supergro bedrock and occurs beneath light brown unweathered till in limited areas; diamicton may be either an older till (Stoffel, 1980) or Tertiary debris fl deposits (P. C. Ryan, written comm., 1999); exposed thickness about 30 feet; subsurface distribution and aquifer potential of the unit is poorly know however its clayey texture suggests the unit is not an aquifer.

Tk **KISHENEHN FORMATION** (upper Eocene-Miocene) - Yellowish brown to orange medium and coarse-grained pebbly sandstone with piec of carbonized wood fragments, pebble and cobble conglomerate, beds of carbonaceous shale, and light olive gray, dusky moderate yellow, and grayi orange mudstone; conglomerate with silty, sandy matrix, well and moderately rounded clasts of argillite, quartzite, and orange siltstone; horizontal beddi and imbricated fabric; sandstone and conglomerate beds have channelized, erosional bases; mudstones have common scoop-shaped, concave- fractures; moderately indurated with calcium carbonate cement; calcium carbonate occurs locally as 0.04-0.2" thick rinds on clasts; steeply dippir cemented fractures in sandstones; about 120 feet of section crops out in steep exposures (Constenius, 1988); water wells completed in sandstone a conglomerate yield adequate supplies of water for household use in a few parts of the northeastern part of the map area and in the valley of the North Fo of the Flathead River.

Ybe **BELT SUPERGROUP ROCKS, UNDIVIDED** (Precambrian Y) - Numerous stratigraphic units composed mostly of siltite, metacarbonate, an quartzite (Johns, 1970; Winston, 1986; Harrison and others, 1992, 1998) and minor amount of igneous rocks (McGimsey, 1985); water wells completed i fractured zones yield adequate supplies for household use.