# Appendix 2. HBC antibiotic resistance determinant groupings

Table A2.1. The genetic determinants of antibiotic resistance predicted in the HBC genomes, as described in CARD, were grouped by the antibiotic to which they are described as conferring resistance. If more than one antibiotic class was included for a single determinant, these determinants were grouped as "non-specific". The exception is for resistances to Macrolide, Lincosamide, Pleuromutilin and Streptogramin (MLPS) antibiotics, as resistance determinants against these antibiotics can have cross-resistance to each other.

| Custom Group | CARD antibiotic classes | Antibiotic resistance gene/determinant | Mechanism |
|---|---|---|---|
| **Acridine dye** | Acridine dye | *emeA* | Antibiotic efflux |
| **Aminocoumarin** | Aminocoumarin antibiotic | *mdtA* | Antibiotic efflux |
| **Aminocoumarin** | Aminocoumarin antibiotic | *mdtB* | Antibiotic efflux |
| **Aminocoumarin** | Aminocoumarin antibiotic | *mdtC* | Antibiotic efflux |
| **Aminoglycoside** | Aminoglycoside | *aac(6')-Ie-aph(2'')-Ia* | Antibiotic inactivation |
| **Aminoglycoside** | Aminoglycoside | *aac(6')-Ii* | Antibiotic inactivation |
| **Aminoglycoside** | Aminoglycoside | *aac(6')-Iih* | Antibiotic inactivation |
| **Aminoglycoside** | Aminoglycoside | *aadA* | Antibiotic inactivation |
| **Aminoglycoside** | Aminoglycoside | *aadK* | Antibiotic inactivation |
| **Aminoglycoside** | Aminoglycoside | *ant(6)-Ia* | Antibiotic inactivation |
| **Aminoglycoside** | Aminoglycoside | *Ant(6)-Ib* | Antibiotic inactivation |
| **Aminoglycoside** | Aminoglycoside | *aph(2'')* | Antibiotic inactivation |
| **Aminoglycoside** | Aminoglycoside | *aph(2'')-If* | Antibiotic inactivation |
| **Aminoglycoside** | Aminoglycoside | *aph(2'')-IIa* | Antibiotic inactivation |

| Custom Group | CARD antibiotic classes | Antibiotic resistance gene/determinant | Mechanism |
|---|---|---|---|
| **Aminoglycoside** | Aminoglycoside | *aph(3'')-Ib* | Antibiotic inactivation |
| **Aminoglycoside** | Aminoglycoside | *aph(3')-Ia* | Antibiotic inactivation |
| **Aminoglycoside** | Aminoglycoside | *aph(3')-IIIa* | Antibiotic inactivation |
| **Aminoglycoside** | Aminoglycoside | *aph(6)-Id* | Antibiotic inactivation |
| **Aminoglycoside** | Aminoglycoside | *kdpE* | Antibiotic efflux |
| **Aminoglycoside** | Aminoglycoside antibiotic | *acrD* | Antibiotic efflux |
| **Beta-lactam** | Carbapenem, cephalosporin, penam | *shv* | Antibiotic inactivation |
| **Beta-lactam** | Cephalosporin | *cblA_1* | Antibiotic inactivation |
| **Beta-lactam** | Cephalosporin | *cepA* | Antibiotic inactivation |
| **Beta-lactam** | Cephalosporin, monobactam, penam | *oxy_2* | Antibiotic inactivation |
| **Beta-lactam** | Cephalosporin, penam | *bcl* | Antibiotic inactivation |
| **Beta-lactam** | Cephalosporin, penam | *bclI* | Antibiotic inactivation |
| **Beta-lactam** | Cephalosporin, penam | *oxa_114a* | Antibiotic inactivation |
| **Beta-lactam** | Cephamycin | *cfxA* | Antibiotic inactivation |
| **Beta-lactam** | Cephamycin | *cmy_101* | Antibiotic inactivation |
| **Beta-lactam** | Monobactam, cephalosporin, penam, penem | *tem* | Antibiotic inactivation |
| **Beta-lactam** | Monobactam, cephamycin, cephalosporin, penam, carbapenem, penem | *K. pneumoniae ompK35* | Resistance by absence or reduced permeability to antibiotic |
| **Beta-lactam** | Penam | *blaZ* | Antibiotic inactivation |
| **Beta-lactam** | Penam, carbapenem, cephamycin, cephalosporin | *act* | Antibiotic inactivation |
| **Beta-lactam** | Penam carbapenem, cephamycin, cephalosporin | *act_1* | Antibiotic inactivation |
| **Beta-lactam** | Penam, carbapenem, cephamycin, cephalosporin, penem, monobactam | *K. pneumoniae ompK36* | Resistance by absence or reduced permeability to antibiotic |
| **Beta-lactam** | Penam carbapenem, cephamycin, cephalosporin, penem, monobactam | *ompC* | Resistance by absence or reduced permeability to antibiotic |
| **Beta-lactam** | Penam, cephalosporin | *ampC_2* | Antibiotic inactivation |

| Custom Group | CARD antibiotic classes | Antibiotic resistance gene/determinant | Mechanism |
|---|---|---|---|
| **Beta-lactam** | Penam, cephalosporin | *oxa_347* | Antibiotic inactivation |
| **Beta-lactam** | Penam ,cephalosporin | *oxa_4* | Antibiotic inactivation |
| **Beta-lactam** | Penam ,cephalosporin, monobactam | *acc* | Antibiotic inactivation |
| **Beta-lactam** | Penam, cephalosporin, monobactam | *oxy* | Antibiotic inactivation |
| **Beta-lactam** | Penam, monobactam, penam, carbapenem, cephamycin, cephalosporin | *K. pneumoniae ompK37* | Resistance by absence or reduced permeability to antibiotic |
| **Beta-lactam** | Penem, penam | *len_1* | Antibiotic inactivation |
| **Chloramphenicol** | Phenicol antibiotic | *cat* | Antibiotic inactivation |
| **Chloramphenicol** | Phenicol antibiotic | *E. faecalis chloramphenicol+* | Antibiotic inactivation |
| **Diaminopyrimidine** | Diaminopyrimidine antibiotic | *dfrA14* | Antibiotic target replacement |
| **Diaminopyrimidine** | Diaminopyrimidine antibiotic | *dfrC* | Antibiotic target replacement |
| **Diaminopyrimidine** | Diaminopyrimidine antibiotic | *dfrE* | Antibiotic target replacement |
| **Diaminopyrimidine** | Diaminopyrimidine antibiotic | *dfrF* | Antibiotic target replacement |
| **Diaminopyrimidine** | Diaminopyrimidine antibiotic | *dfrG* | Antibiotic target replacement |
| **Elfamycin** | Elfamycin | *E. coli ef-tu* | Antibiotic target alteration |
| **Fluoroquinolone** | Fluoroquinolone antibiotic | *emrA* | Antibiotic efflux |
| **Fluoroquinolone** | Fluoroquinolone antibiotic | *emrB* | Antibiotic efflux |
| **Fluoroquinolone** | Fluoroquinolone antibiotic | *emrR* | Antibiotic efflux |
| **Fluoroquinolone** | Fluoroquinolone antibiotic | *mdtH* | Antibiotic efflux |
| **Fluoroquinolone** | Fluoroquinolone antibiotic | *patA* | Antibiotic efflux |
| **Fosfomycin** | Fosfomycin | *E. coli cyaA* | Antibiotic target alteration |
| **Fosfomycin** | Fosfomycin | *E. coli glpT* | Antibiotic target alteration |
| **Fosfomycin** | Fosfomycin | *E. coli uhpA* | Antibiotic target alteration |
| **Fosfomycin** | Fosfomycin | *E. coli uhpT* | Antibiotic target alteration |
| **Fosfomycin** | Fosfomycin | *fosA2* | Antibiotic inactivation |

| Custom Group | CARD antibiotic classes | Antibiotic resistance gene/determinant | Mechanism |
|---|---|---|---|
| **Fosfomycin** | Fosfomycin | *fosA5* | Antibiotic inactivation |
| **Fosfomycin** | Fosfomycin | *fosA7* | Antibiotic inactivation |
| **Fosfomycin** | Fosfomycin | *fosB* | Antibiotic inactivation |
| **Fosfomycin** | Fosfomycin | *mdtG* | Antibiotic efflux |
| **Glycopeptide** | Glycopeptide antibiotic | *vanA* | Antibiotic target alteration |
| **Glycopeptide** | Glycopeptide antibiotic | *vanC* | Antibiotic target alteration |
| **Glycopeptide** | Glycopeptide antibiotic | *vanD* | Antibiotic target alteration |
| **Glycopeptide** | Glycopeptide antibiotic | *vanHA* | Antibiotic target alteration |
| **Glycopeptide** | Glycopeptide antibiotic | *vanHD* | Antibiotic target alteration |
| **Glycopeptide** | Glycopeptide antibiotic | *vanRA* | Antibiotic target alteration |
| **Glycopeptide** | Glycopeptide antibiotic | *vanRC* | Antibiotic target alteration |
| **Glycopeptide** | Glycopeptide antibiotic | *vanRD* | Antibiotic target alteration |
| **Glycopeptide** | Glycopeptide antibiotic | *vanSA* | Antibiotic target alteration |
| **Glycopeptide** | Glycopeptide antibiotic | *vanSC* | Antibiotic target alteration |
| **Glycopeptide** | Glycopeptide antibiotic | *vanTC* | Antibiotic target alteration |
| **Glycopeptide** | Glycopeptide antibiotic | *vanXA* | Antibiotic target alteration |
| **Glycopeptide** | Glycopeptide antibiotic | *vanXD* | Antibiotic target alteration |
| **Glycopeptide** | Glycopeptide antibiotic | *vanXYC* | Antibiotic target alteration |
| **MLPS** | Lincosamide antibiotic | *lmrB* | Antibiotic efflux |
| **MLPS** | Lincosamide antibiotic | *lnuC* | Antibiotic inactivation |
| **MLPS** | Lincosamide antibiotic | *lnuG* | Antibiotic inactivation |
| **MLPS** | Lincosamide antibiotic macrolide antibiotic, streptogramin antibiotic | *ermB* | Antibiotic target alteration |
| **MLPS** | Lincosamide antibiotic, streptogramin antibiotic, macrolide antibiotic | *ermG* | Antibiotic target alteration |
| **MLPS** | Macrolide antibiotic | *mefA* | antibiotic efflux |
| **MLPS** | Macrolide antibiotic, lincosamide antibiotic, streptogramin antibiotic | *ermF* | Antibiotic target alteration |

| Custom Group | CARD antibiotic classes | Antibiotic resistance gene/determinant | Mechanism |
|---|---|---|---|
| **MLPS** | Pleuromutilin antibiotic, lincosamide antibiotic | *lsaE* | Antibiotic efflux |
| **MLPS** | Pleuromutilin antibiotic, lincosamide antibiotic, streptogramin antibiotic | *eatAv* | Antibiotic efflux |
| **MLPS** | Streptogramin antibiotic, lincosamide antibiotic, macrolide antibiotic | *ermQ* | Antibiotic target alteration |
| **MLPS** | Streptogramin antibiotic, lincosamide antibiotic, pleuromutilin antibiotic | *lsaA* | Antibiotic efflux |
| **MLPS** | Streptogramin antibiotic, macrolide antibiotic | *mel* | Antibiotic efflux |
| **MLPS** | Streptogramin antibiotic, macrolide antibiotic | *msrC* | Antibiotic efflux |
| **MLPS** | Streptogramin antibiotic, macrolide antibiotic, lincosamide antibiotic | *ermD* | Antibiotic efflux |
| **MLPS** | Streptogramin antibiotic, pleuromutilin antibiotic | *vgaC* | Antibiotic efflux |
| **Mupirocin** | Mupirocin | *ileS* | antibiotic target alteration |
| **Nitrofuran** | Nitrofuran antibiotic | *nfsA* | antibiotic target alteration |
| **Nitroimidazole** | Nitroimidazole antibiotic | *msbA* | Antibiotic efflux |
| **Non-specific** | Acridine dye, fluoroquinolone antibiotic | *blt* | Antibiotic efflux |
| **Non-specific** | Acridine dye, fluoroquinolone antibiotic | *cdeA* | Antibiotic efflux |
| **Non-specific** | Aminocoumarin antibiotic, aminoglycoside antibiotic | *baeR* | Antibiotic efflux |
| **Non-specific** | Aminocoumarin antibiotic, aminoglycoside antibiotic | *baeS* | Antibiotic efflux |
| **Non-specific** | Aminocoumarin antibiotic, aminoglycoside antibiotic | *cpxA* | Antibiotic efflux |
| **Non-specific** | Aminoglycoside antibiotic, fluoroquinolone antibiotic | *mipA* | Resistance by absence or reduced permeability to antibiotic |
| **Non-specific** | Aminoglycoside antibiotic, tetracycline antibiotic, phenicol antibiotic | *ykkC* | Antibiotic efflux |
| **Non-specific** | Cephalosporin, macrolide antibiotic, aminoglycoside antibiotic, fluoroquinolone antibiotic | *axyX* | Antibiotic efflux |
| **Non-specific** | Cephalosporin, macrolide antibiotic, aminoglycoside antibiotic, fluoroquinolone antibiotic | *axyZ* | Antibiotic efflux |
| **Non-specific** | Fluoroquinolone antibiotic, acridine dye | *norA* | Antibiotic efflux |
| **Non-specific** | Fluoroquinolone antibiotic, macrolide antibiotic, penam, cephamycin, cephalosporin, tetracycline antibiotic | *h_ns* | Antibiotic efflux |

| Custom Group | CARD antibiotic classes | Antibiotic resistance gene/determinant | Mechanism |
|---|---|---|---|
| **Non-specific** | Fluoroquinolone antibiotic, penam, cephamycin, cephalosporin | *acrF* | Antibiotic efflux |
| **Non-specific** | Fluoroquinolone antibiotic, penam, macrolide antibiotic | *crp* | Antibiotic efflux |
| **Non-specific** | Fluoroquinolone antibiotic, penam, macrolide antibiotic | *mdtE* | Antibiotic efflux |
| **Non-specific** | Fluoroquinolone antibiotic, penam, tetracycline antibiotic, macrolide antibiotic | *evgA* | Antibiotic efflux |
| **Non-specific** | Glycopeptide antibiotic, streptogramin antibiotic, lincosamide antibiotic, macrolide antibiotic, phenicol antibiotic, pleuromutilin antibiotic | *Propionibacterium 23S rRNA* | Antibiotic target alteration |
| **Non-specific** | Glycopeptide antibiotic, streptogramin antibiotic, lincosamide antibiotic, macrolide antibiotic, phenicol antibiotic, pleuromutilin antibiotic | *S. pneumoniae 23S rRNA* | Antibiotic target alteration |
| **Non-specific** | Glycopeptide antibiotic, streptogramin antibiotic, macrolide antibiotic, phenicol antibiotic, lincosamide antibiotic, pleuromutilin antibiotic | *E. coli 23S rRNA* | Antibiotic target alteration |
| **Non-specific** | Glycopeptide antibiotic, streptogramin antibiotic, macrolide antibiotic, phenicol antibiotic, lincosamide antibiotic, pleuromutilin antibiotic, oxazolidinone antibiotic | *S. aureus 23S rRNA* | Antibiotic target alteration |
| **Non-specific** | Glycopeptide antibiotic, tetracycline antibiotic, glycylcycline, nucleoside antibiotic, aminoglycoside antibiotic, peptide antibiotic | *rrsB* | Antibiotic target alteration |
| **Non-specific** | Glycopeptide antibiotic, tetracycline antibiotic, peptide antibiotic, aminoglycoside antibiotic, nucleoside antibiotic, glycylcycline | *M. abscessus 16S rRNA* | Antibiotic target alteration |
| **Non-specific** | Macrolide antibiotic, cephalosporin, aminoglycoside antibiotic, fluoroquinolone antibiotic | *axyY* | Antibiotic efflux |
| **Non-specific** | Macrolide antibiotic, cephalosporin, aminoglycoside antibiotic, fluoroquinolone antibiotic | *oprZ* | Antibiotic efflux |
| **Non-specific** | Macrolide antibiotic, fluoroquinolone antibiotic | *efmA* | Antibiotic efflux |
| **Non-specific** | Macrolide antibiotic, penam, fluoroquinolone antibiotic | *gadW* | Antibiotic efflux |
| **Non-specific** | Macrolide antibiotic, penam, fluoroquinolone antibiotic | *gadX* | Antibiotic efflux |
| **Non-specific** | Nucleoside antibiotic, acridine dye | *mdtN* | Antibiotic efflux |
| **Non-specific** | Nucleoside antibiotic, acridine dye | *mdtO* | Antibiotic efflux |
| **Non-specific** | Nucleoside antibiotic, acridine dye | *mdtP* | Antibiotic efflux |
| **Non-specific** | Nucleoside antibiotic, phenicol antibiotic, acridine dye, fluoroquinolone antibiotic | *bmr* | Antibiotic efflux |

| Custom Group | CARD antibiotic classes | Antibiotic resistance gene/determinant | Mechanism |
|---|---|---|---|
| **Non-specific** | Nucleoside antibiotic, phenicol antibiotic, lincosamide antibiotic, fluoroquinolone antibiotic, acridine dye | *mdtM* | Antibiotic efflux |
| **Non-specific** | Penam, cephamycin, cephalosporin, fluoroquinolone antibiotic | *acrE* | Antibiotic efflux |
| **Non-specific** | Penam, macrolide antibiotic, fluoroquinolone antibiotic | *mdtF* | Antibiotic efflux |
| **Non-specific** | Peptide antibiotic, macrolide antibiotic | *mgrB* | Resistance by absence, antibiotic efflux and antibiotic target alteration |
| **Non-specific** | Tetracycline antibiotic, benzalkonium chloride, rhodamine | *mdfA* | Antibiotic efflux |
| **Non-specific** | Tetracycline antibiotic, cephalosporin, rifamycin antibiotic, phenicol antibiotic, glycylcycline, penam, fluoroquinolone antibiotic, triclosan | *acrA1* | Antibiotic efflux |
| **Non-specific** | Tetracycline antibiotic, diaminopyrimidine antibiotic, glycylcycline, nitrofuran antibiotic, fluoroquinolone antibiotic | *oqxA* | Antibiotic efflux |
| **Non-specific** | Tetracycline antibiotic, fluoroquinolone antibiotic | *E. coli lamB* | Resistance by absence or reduced permeability to antibiotic |
| **Non-specific** | Tetracycline antibiotic, glycylcycline, rifamycin antibiotic, phenicol antibiotic, fluoroquinolone antibiotic, penam, cephamycin, cephalosporin, triclosan | *acrS* | Antibiotic efflux |
| **Non-specific** | Tetracycline antibiotic, macrolide antibiotic, fluoroquinolone antibiotic, penam | *evgS* | Antibiotic efflux |
| **Non-specific** | Tetracycline antibiotic, nitrofuran antibiotic, fluoroquinolone antibiotic, glycylcycline, diaminopyrimidine antibiotic | *oqxB* | Antibiotic efflux |
| **Non-specific** | Tetracycline antibiotic, penam, cephalosporin, glycylcycline, rifamycin antibiotic, phenicol antibiotic, triclosan, fluoroquinolone antibiotic | *acrB* | Antibiotic efflux |
| **Non-specific** | Tetracycline antibiotic, penam, cephalosporin, rifamycin antibiotic, phenicol antibiotic, glycylcycline, fluoroquinolone antibiotic, triclosan | *acrA* | Antibiotic efflux |
| **Non-specific** | Tetracycline antibiotic, penam, cephalosporin, rifamycin antibiotic, phenicol antibiotic, glycylcycline, fluoroquinolone antibiotic, triclosan | *marR* | Antibiotic efflux and antibiotic target alteration |
| **Non-specific** | Tetracycline antibiotic, penem, penam, carbapenem, cephamycin, cephalosporin, rifamycin antibiotic, phenicol antibiotic, monobactam, glycylcycline, fluoroquinolone antibiotic, triclosan | *marA* | Antibiotic efflux and reduced permeability to beta-lactams |

| Custom Group | CARD antibiotic classes | Antibiotic resistance gene/determinant | Mechanism |
|---|---|---|---|
| **Non-specific** | Tetracycline antibiotic, phenicol antibiotic, aminoglycoside antibiotic | *ykkD* | Antibiotic efflux |
| **Non-specific** | Tetracycline antibiotic, phenicol antibiotic, glycylcycline, penam, cephalosporin, rifamycin antibiotic, fluoroquinolone antibiotic, triclosan | *acrA2* | Antibiotic efflux |
| **Non-specific** | Tetracycline antibiotic, rifamycin antibiotic, phenicol antibiotic, aminocoumarin antibiotic, fluoroquinolone antibiotic, penam, cephamycin, cephalosporin, glycylcycline, macrolide antibiotic, triclosan | *tolC* | Antibiotic efflux |
| **Non-specific** | Tetracycline antibiotic, rifamycin antibiotic, phenicol antibiotic, glycylcycline, penam, cephalosporin, triclosan, fluoroquinolone antibiotic | *ramR* | Antibiotic efflux |
| **Non-specific** | | *emrD* | Antibiotic efflux |
| **Non-specific** | | *emrE* | Antibiotic efflux |
| **Nucleoside** | Nucleoside antibiotic | *sat2* | Antibiotic inactivation |
| **Nucleoside** | Nucleoside antibiotic | *sat4* | Antibiotic inactivation |
| **Nucleoside** | Nucleoside antibiotic | *tmrB* | Reduced permeability to antibiotic |
| **Peptide** | Peptide antibiotic | *bacA* | Antibiotic target alteration |
| **Peptide** | Peptide antibiotic | *bcrA* | Antibiotic efflux |
| **Peptide** | Peptide antibiotic | *bcrB* | Antibiotic efflux |
| **Peptide** | Peptide antibiotic | *bcrC* | Antibiotic efflux |
| **Peptide** | Peptide antibiotic | *eptA* | Antibiotic target alteration |
| **Peptide** | Peptide antibiotic | *mprF* | Antibiotic target alteration |
| **Peptide** | Peptide antibiotic | *mprF3* | Antibiotic target alteration |
| **Peptide** | Peptide antibiotic | *mprF4* | Antibiotic target alteration |
| **Peptide** | Peptide antibiotic | *pmrF* | Antibiotic target alteration |
| **Peptide** | Peptide antibiotic | *ugd* | Antibiotic target alteration |
| **Peptide** | Peptide antibiotic | *yojI* | Antibiotic efflux |

| Custom Group | CARD antibiotic classes | Antibiotic resistance gene/determinant | Mechanism |
|---|---|---|---|
| **Sulphonamide** | Sulfonamide antibiotic, sulfone antibiotic | *sul2* | Antibiotic target replacement |
| **Tetracycline** | Tetracycline antibiotic | *emrK* | Antibiotic efflux |
| **Tetracycline** | Tetracycline antibiotic | *emrY* | Antibiotic efflux |
| **Tetracycline** | Tetracycline antibiotic | *P. acnes 16S rRNA* | Antibiotic target alteration |
| **Tetracycline** | Tetracycline antibiotic | *tet_40* | Antibiotic efflux |
| **Tetracycline** | Tetracycline antibiotic | *tet_J* | Antibiotic efflux |
| **Tetracycline** | Tetracycline antibiotic | *tet_K* | Antibiotic efflux |
| **Tetracycline** | Tetracycline antibiotic | *tet44* | Antibiotic target protection |
| **Tetracycline** | Tetracycline antibiotic | *tetA_46* | Antibiotic efflux |
| **Tetracycline** | Tetracycline antibiotic | *tetA_P* | Antibiotic efflux |
| **Tetracycline** | Tetracycline antibiotic | *tetB_P* | Antibiotic target protection |
| **Tetracycline** | Tetracycline antibiotic | *tetM* | Antibiotic target protection |
| **Tetracycline** | Tetracycline antibiotic | *tetO* | Antibiotic target protection |
| **Tetracycline** | Tetracycline antibiotic | *tetQ* | Antibiotic target protection |
| **Tetracycline** | Tetracycline antibiotic | *tetS* | Antibiotic target protection |
| **Tetracycline** | Tetracycline antibiotic, glycylcycline | *tetA* | Antibiotic efflux |

**Table A2.2. A complete list of HBC isolates and the antibiotic resistance genes and mutations identified in their genomes.** The genetic determinants of antibiotic resistance predicted in the HBC genomes, as described in CARD, were grouped by the antibiotic to which they are described as conferring resistance. If more than one antibiotic class was included for a single determinant, these determinants were grouped as "non-specific". The exception is for resistances to Macrolide, Lincosamide, Pleuromutilin and Streptogramin (MLPS) antibiotics, as resistance determinants against these antibiotics can have cross-resistance to each other. The table can be viewed here:

https://docs.google.com/spreadsheets/d/1zwmhUicOW3JVW_9y6P6LssbavW47EFiRq4_wwnS9CMg/edit?usp=sharing

This table can also be found on the CD included with the hard copy of this thesis.